GERMAN FIELD ARTILLERY OF WORLD WAR II

STEVEN J. ZALOGA

ILLUSTRATED BY FELIPE RODRÍGUEZ

NEW VANGUARD 325

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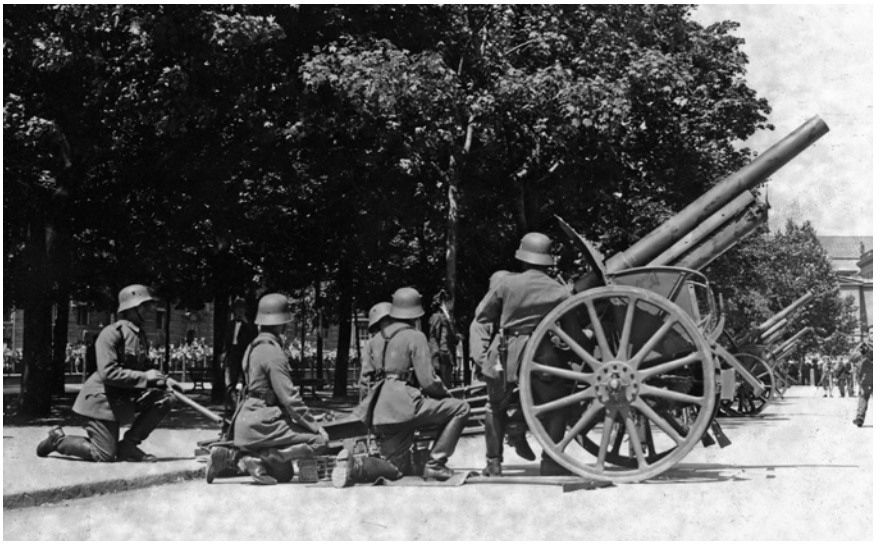
GERMAN FIELD ARTILLERY OF WORLD WAR II

INTRODUCTION

The vital role of German artillery in World War I is well appreciated, less so for World War II. In the popular imagination, Panzers and Stukas have dominated the literature on World War II. Nevertheless, field artillery remained the primary killer on the World War II battlefield, often responsible for three-quarters of combat casualties. This book takes a look at the field artillery of the Wehrmacht in World War II.

A major problem in organizing this short survey was the sheer number of artillery types used by the Wehrmacht in 1939–45. In 1939–41, Germany captured most of the other European artillery arsenals. As a result, a survey of every cannon used by the Wehrmacht could become an unmanageable catalog of virtually every European field gun type. Instead, the focus here is on the principal German types, though the more important war-booty guns (*Beutegeschütze*) are covered. Divisional field artillery was the predominant category and so is covered here in the most detail. Weapons at the extreme end such as siege guns and railroad artillery have already been covered in the

One of the most futuristic artillery weapons of the Wehrmacht in World War II was this 10.5cm leFH 43 developed by Škoda. It was mounted on a cruciform carriage to provide easy 360-degree traverse. It never entered serial production since the artillery branch ran a distant second to the Panzer branch for industrial resources after 1943.



The Rheinmetall 10.5cm leFH 16 entered service in 1917. The Reichswehr retained 496 of these light field howitzers and they remained in Wehrmacht service in dwindling numbers through the war.

Osprey New Vanguard series.[1] Artillery in Panzer divisions generally used the same guns as those in infantry divisions, sometimes on self-propelled chassis. The self-propelled types are not covered here, since this subject warrants its own discussion and has been covered elsewhere.[2] Recoilless rifles, Flak, anti-tank guns, and fortification guns are also outside the scope of this book.

ARTILLERY ORGANIZATION

The Versailles Treaty that ended World War I placed strict limits on the post-war German army. The Reichswehr was allowed only seven infantry divisions and their associated field guns, amounting to 204 7.7cm FK field guns and 84 10.5cm leFH 16 field howitzers. Heavy artillery was restricted largely to the fortress artillery of Festung Königsberg. In reality, the Reichswehr had a larger arsenal, hidden away from treaty inspectors. Paradoxically, the Versailles limitations led to Germany eventually acquiring an entirely new generation of artillery pieces in the 1930s after Hitler renounced the treaty. Development of the new artillery actually began prior to the ascent of the Nazi Party, with a surreptitious program started in the late 1920s. However, manufacture of the new field artillery did not take place until after Hitler's accession to power.

Divisional artillery

The organization of the Wehrmacht's field artillery was a modest evolution from the patterns of World War I in 1918. At the outbreak of World War II in 1939, divisional field artillery was found in two formations in the standard infantry division: cannon companies in each infantry regiment, and an artillery regiment in each division.

Each infantry regiment had a cannon company equipped with infantry guns. There were three platoons (*Züge*) of the 7.5cm leichte Infanteriegeschütz

1 Marc Romanych, Martin Rupp, *New Vanguard 280: World War II German Super-Heavy Siege Guns* (Osprey, 2020); Steven Zaloga, *New Vanguard 231: Railway Guns of World War II* (Osprey, 2016).
2 Thomas Anderson, *Panzerartillerie: Firepower for the Panzer Divisions* (Osprey, 2019).

A 15cm sFH 18 für Kraftzug in action with a smoking propellant casing having been ejected from the breech. A woven reed mat can be seen under the wheel, intended to prevent the heavy howitzer from sinking any further into the soft soil.

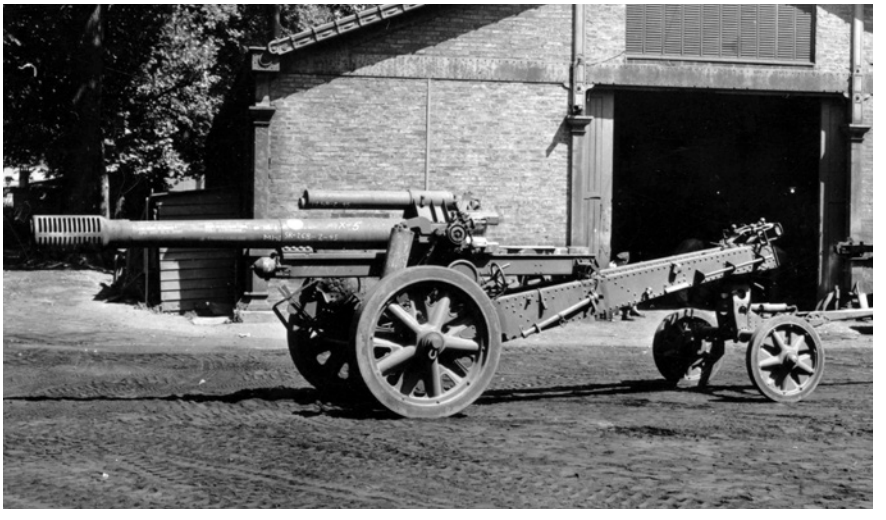
and one platoon with the 15cm schwere Infanteriegeschütz. Each platoon had two guns each, and in a standard three-regiment division, there were a total of 18 7.5cm leIG and six 15cm sIG. These were primarily direct-fire weapons, intended to provide immediate infantry fire support.

The backbone of divisional firepower was an artillery regiment. These regiments generally had three light artillery battalions with 12 10.5cm howitzers each, and one heavy artillery battalion with 12 15cm howitzers each. The light artillery battalions were usually assigned on a scale of one battalion per infantry regiment, but the three battalions could also be concentrated depending on the tactical circumstances. The heavy howitzer battalion was assigned division-wide missions, such as counter-battery missions against enemy artillery.

The preceding description presents an ideal version of German divisional artillery organization. There were numerous variations due to the irregularities of German infantry formation. The Wehrmacht's infantry divisions were called up in 35 waves. The first waves organized in the mid-1930s generally followed the standard organization. Divisions of the second through sixth waves lacked an artillery observation battalion. Eleven of the fifth- and sixth-wave divisions were armed with Czech field guns. The seventh-wave divisions lacked a heavy howitzer battalion, and their light battalions had only two batteries so the division had only 24 light howitzers in total. A perennial problem with German artillery, especially after the start of the war with the Soviet Union in 1941, was the shortage of authorized weapons. Many units on the Eastern Front operated at 75 percent strength or less. Some units had the authorized numbers of field howitzers, but were obliged to use obsolete or war-booty types rather than the standard German types. The regimental infantry gun companies often had shortages of the 15cm sIG 33 and depended solely on the 7.5cm leIG 18. There were other organizational changes in 1944 such as the Volksgrenadier-Division that changed divisional artillery organization as is described further below.

GHQ artillery

Besides the divisional artillery, there were independent battalions and regiments under the Heeres-Artillerie, referred to as GHQ artillery in Britain and the United States. These were specialized formations subordinate to field army and army group headquarters. These formations were intended to concentrate additional artillery at critical points of the battlefield. They could be temporarily attached to infantry divisions during a campaign. These units included heavier and longer-range guns than in the divisions, as well as more specialized types such as Nebelwerfer multiple-rocket launchers. Generally speaking, the Heeres-Artillerie usually represented about



One of the rarest of the 10.5cm heavy field howitzers was the 15cm sFH 36, designed to be horse-towed without the need to break the howitzer into two loads. It was not successful and only a modest number were manufactured.

12–15 percent of the field artillery of the Wehrmacht in combat, though a larger percentage of overall firepower since its guns generally fired heavier munitions. In some campaigns later in the war, for example the Ardennes offensive in December 1944, the Heeres-Artillerie constituted about a third of German artillery strength.

In the case of units subordinate to a corps, these formations were coordinated by a special staff called an Arko (*Artillerie Kommandeur*). The Arko was supported by specialized units such as an observation battalion (*Beobachstungs Abteilung*) that included a sound-ranging battery, a flash-ranging battery, a survey battery, a communications platoon, and a meteorological section. This command-and-control system could provide a division or corps commander with an artillery fire plan to provide supporting fire along the whole corps line so that the individual batteries and battalions would mutually support each other. Thanks to the unity of command provided by the Arko, it was possible to quickly direct a large number of batteries to a specific target from several directions. Formations assigned at higher levels such as for field army support were assigned a Harko (*Höher Artillerie Kommandeur*) that could coordinate several Arko.

Independent artillery units were generally armed with more powerful guns than those found in the divisions. These were used for a variety of missions including counter-battery fire, interdiction, and harassing fire. Counter-battery missions were directed against enemy artillery. Interdiction and harassing missions generally attacked enemy formations, road networks, and other fixed geographical targets beyond the reach of divisional artillery. The Wehrmacht began organizing larger independent artillery formations in 1943, including divisions and brigades, prompted by its encounters with massed Soviet artillery.

Moving the guns

The vast majority of German divisional artillery battalions were horse-drawn during the war, totaling about 1,060 battalions compared with only about 105 motorized battalions. In contrast, most of the Heeres-Artillerie battalions were motorized since it was not practical to use horse-traction for heavy artillery.

The 7.5cm leIG 18 für Bespannung was the basic version of the infantry gun fitted with spoked wooden wheels for horse towing.

German infantry divisions were dependent on horse-traction for most of the war. The basic artillery regiment in a standard infantry division was authorized 2,318 horses, 441 horse-drawn trailers and caissons, and only 34 trucks. Horse fodder was a major logistical burden for these units. In contrast, a motorized artillery regiment only required about 410 trucks and half-tracks. The motorized artillery regiments were intended for motorized infantry, Panzer, and Panzer-Grenadier divisions.

The basic types of German field artillery in World War II were manufactured in two configurations – for horse traction (*für Bespannung* – Bespg. – for team towing), or motorized towing (*für Kraftzug* – Kfz. – for truck towing). These guns differed primarily in their wheels. Simple steel rims were used for horse traction and solid rubber rims for motorized towing. Other differences were the *Protze* (caisson) issued with a horse-towed gun and the pneumatic brakes fitted to guns for motorized towing.

German KStN tables of equipment authorized specific types of prime movers for each type of field gun in motorized formations. They are listed here on the accompanying chart. It will be noticed that half-tracks were the predominant type for all but the lightest guns since standard German trucks did not have good cross-country capability. However, there was a perennial shortage of half-tracks, and so units were often saddled with less satisfactory substitutes, mainly trucks.

A

TOWING THE INFANTRY GUNS

The standard prime mover for the 7.5cm Infanteriegeschütz 18 was the Kfz. 12 mittelschwerer geländegängiger Personenkraftwagen, manufactured by Auto Union's Horch factory in Zwickau. The more substantial 15cm schwere Infanteriegeschütz 33 was towed by a Sd.Kfz. 10 1-tonne half-track. This vehicle was not entirely suitable for such a heavy weapon under muddy conditions, and other vehicles such as the heavier 3-tonne Sd.Kfz. 11 half-track were sometimes used as a substitute. Both vehicles are shown here in an over dark gray finish, typical for equipment manufactured in 1939–43.

1

2

Motorized towing	
Weapon	**Prime mover**
7.5cm leIG	Kfz. 12
10.5cm leFH 30(t)	SdKfz. 11
10.5cm leFH18	SdKfz. 11, RSO
10.5cm Geb H 40	SdKfz. 2
10cm K18	SdKfz. 7
10cm K35(t)	SdKfz. 7
10cm K332(f)	SdKfz. 7
12.2cm KH (r)	SdKfz. 7
15.2cm KH (r)	SdKfz. 7
15cm sIG 33	SdKfz. 10
15cm sFH 18	SdKfz. 7
15cm sFH 37(t)	SdKfz. 7
15cm sFH 414(f)	SdKfz. 7
15cm SK C/28	SdKfz. 8*
15cm K 18	SdKfz. 8*
17cm K 18	SdKfz. 8*
19.4cm Kanone 485(f)	SdKfz. 8
21cm Kanone 39	SdKfz. 9**
21cm Mörser 18	SdKfz. 8*
24cm Kanone K3	SdKfz. 8**
24cm M39/40	SdKfz. 8**
30.5cm M(t)	SdKfz. 8**
Nebelwerfer	
15cm Nbl. W. 41	SdKfz. 11
21cm Nbl. W. 42	SdKfz. 11
30cm Nbl. W. 42	SdKfz. 11
28cm/32cm Nbl. W. 41	SdKfz. 11

** in two loads*

*** in multiple loads*

Infantry guns

Light infantry guns

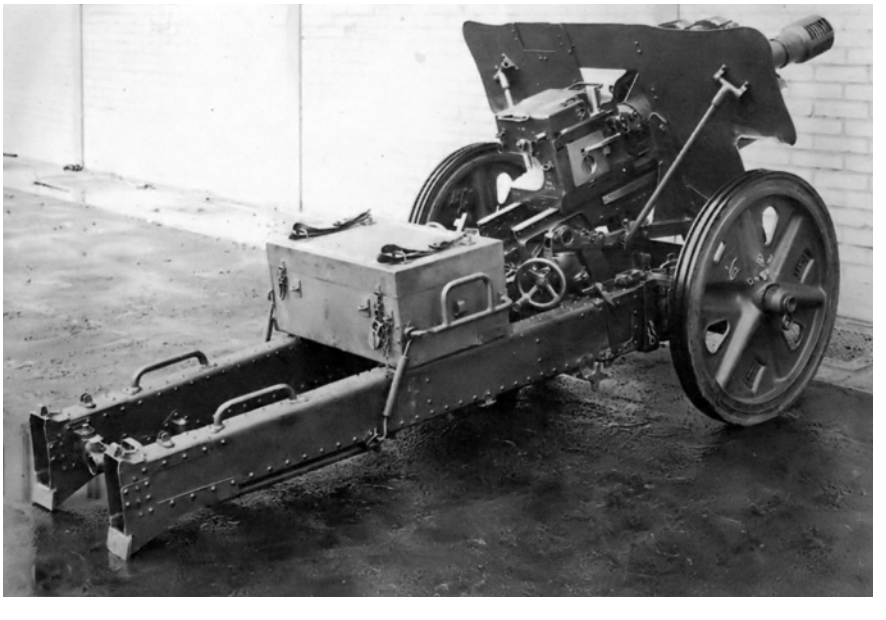
The "pocket artillery" of the German infantry regiments was the 7.5cm *leichtes Infanteriegeschütz* (light infantry gun). This was strongly influenced by trench warfare tactics during World War I. The infantry often encountered enemy defensive positions in close combat that would be difficult to eliminate using divisional field artillery. A variety of different types of weapons were in use by the end of the war, including the 7.6cm *leichte Minenwerfer neue Art* (new model light trench mortar) and Krupp 7.7cm Infanteriegeschütze 18.

In 1927, Rheinmetall-Borsig began work on a replacement that was originally designated as the 7.5cm leichtes Minenwerfer 18. It was formally adopted for service in 1932 and subsequently redesignated as the 7.5cm leichtes Infanteriegeschütz 18. The gun barrel was quite short, only L/11.8, and so it had a maximum range of about 3.5km. The carriage used a box frame and the cannon used an unusual shotgun-style breech assembly. Two different versions were manufactured: the basic type with wooden wheels for horse traction, and a version with pneumatic tires for motorized towing. These guns weighed 515–570kg, and so could be moved for short distances

One of the two configurations of the 7.5cm leIG 18 was with pneumatic tires as seen here. This is a battery from SS-Infanterie-Regiment 9 "Thule" while supporting Finnish troops on August 4, 1941 near Kiestinki, Finland. (SA-kuva)

by their crew. The early versions of the StuG III assault gun were essentially a mechanized counterpart of this weapon. The 7.5cm leIG 18 was built in larger numbers than any other German artillery weapon of the war except for the 10.5cm leFH 18. Specialized pack-howitzer versions of this weapon were developed for the mountain infantry and paratroopers but neither was manufactured in significant numbers.

The Heereswaffenamt (HWA) issued a specification for a more modern infantry gun in 1940. Due to the tank crisis of 1941 caused by the debut of new Soviet tanks, this requirement evolved into a hybrid anti-tank/infantry support gun. Rheinmetall designed a new L/22 barrel that could fire the new 7.5cm Hohlgranate HL/A shaped-charge anti-tank projectile. This program



The 7.5cm Gebirgsgeschütz 36 was a specialized mountain gun that was designed to be broken down into multiple pack loads for mule carriage. This shows it prepared for motorized towing with trails locked and the accessories box mounted on the trails.

The 7.5cm IG 42 followed the IG 37 into production in late 1944 once the supply of old anti-tank gun carriages ran out. It used a new carriage designed for the 8cm PAW 600 anti-tank gun.

petered out in 1942 but was revived in 1944 due to heavy losses of infantry guns in 1943–44. As an expedient, the new gun was mounted on obsolete 3.7cm PaK 35/36 carriages as well as war-booty Soviet 37mm and 45mm anti-tank gun carriages. These were essentially similar since the basic Soviet version had been license-produced from Rheinmetall in the early 1930s. This new conversion was accepted for use as the 7.5cm PaK 37 but was redesignated as 7.5cm IG 37 when production began in May 1944. Since the supply of carriages was limited, another version called the 7.5cm IG 42 was authorized. This used the same gun but was fitted to the carriage that had been developed for the 8cm PAW 600 anti-tank gun. This was produced in small numbers starting in October 1944.

Heavy infantry guns

Heavy infantry fire support was provided by the 15cm schwere Infanteriegeschütze 33. This was developed alongside the 7.5cm leIG 18 at Rheinmetall-Borsig starting in 1927. Like the smaller gun, it used a box carriage instead of split trails. The initial production version was the 15cm sIG 33 Ausführung A that was adopted in 1936. This used a steel carriage with leaf springs for the axles. In 1938, a lightened carriage was introduced using mixed steel/aluminum construction and torsion bars rather than leaf springs. This reduced the weight from 1,750kg to 1,550kg. It entered production as the sIG 33 Ausf. B but manufacture was short-lived, lasting only to 1939 since the priority for aluminum favored the Luftwaffe.

A 15cm sIG 33 Ausf. A für Bespannung with the standard steel-rimmed wheels for horse towing. The firing lanyard is attached to the firing pin, with the cord running off to the right of the gun.

The carriage construction reverted to steel for the remainder of the war though the guns retained some of the other upgrades of the Ausf. B.

As in the case of most German divisional artillery, both horse-traction and motorized versions of the 15cm sIG 33 were produced. This was a much more substantial weapon than the 7.5cm leIG 18, weighing about 1.8 tonnes. Various self-propelled versions of the 15cm infantry gun were produced, starting with a type on the obsolete PzKpfw I chassis in 1940.

Infantry guns technical data

Type	7.5cm leIG 18	7.5cm IG 37	7.5cm Geb H 36	15cm sIG 33
Caliber	L/11.8	L/22	L/19.3	L/26
Length (m)	2.75	4.78	4.16	4.3
Width (m)	1.6	1.8	1.19	2.15
Height (m)	1.2	1.07	1.24	1.65
Weight (kg)	400–440	430	748	1,550–1,750
Elevation (degrees)	-10 to +75	-5 to +24	-2 to +70	-4 to + 75
HE projectile weight (kg)	6	6	6	38
Muzzle velocity (m/s)	222	350	475	240
Rate of fire (rpm)	8–12	8–12	6–8	2–3
Max. range (km)	3.5	4.8	9.2	4.6

Infantry gun ammunition production 1939–45 (rounds in thousands)

	1939	1940	1941	1942	1943	1944	1945	Total
7.5cm	628.4	3,137.3	976.9	4,145.1	9,212.9	10,664.8	1,332.0	**30,097.4**
7.62cm (r)				30.0	1,543.5	879.9	67.0	**2,520.4**
15cm	185.4	492.6	420.4	605.1	2,280.4	2,279.6	157.5	**6,421.0**
Total	**813.8**	**3,629.9**	**1,397.3**	**4,780.2**	**13,036.8**	**13,824.3**	**1,556.5**	**39,038.8**

Divisional artillery

Old and eccentric: the 7.5cm field gun

Field guns in the 7.5–7.7cm range were the predominant divisional guns in the German army in World War I prior to the shift to 10.5cm howitzers. In the 1920s, the Reichswehr still had 78 7.7cm Feldkanone 96/16, and 298 7.5cm Feldkanone 16. Although the new Wehrmacht decided to shift to the 10.5cm leFH 18 as its basic light divisional cannon, these older guns were still in use in the early years of the war due to shortages.

In the mid-1930s, Krupp developed the 7.5cm leFK 18, a modernized version of the 7.5cm Feldkanone 16, aimed at the export market. Brazil was the first customer in 1938. When war broke out, the Wehrmacht took over the 108 guns that had not yet been delivered. Krupp continued to improve this gun for export sale with a longer

The 7.5cm IG 37 was intended as a hybrid infantry gun/anti-tank gun. It was widely used in Volksgrenadier divisions and other units formed in 1944. This is a rare example preserved at the Deutsches Panzermuseum in Münster. (Deutsches Panzermuseum)

The 7.5cm Feldkanone 7M85 was an attempt to create a hybrid anti-tank gun/field gun for the Volksgrenadier divisions. It consisted of a 7.5cm gun barrel mounted on the carriage of the 10.5cm leFH 18/40. Only ten were completed in 1944.

L/54 barrel as the 7.5cm FK 38. In the face of the tank crisis of 1941, the Wehrmacht ordered 80 of these in 1942. These were a stop-gap since they had better anti-tank performance than the old 7.5cm guns. Further purchases did not take place due to the advent of dedicated anti-tank guns such as the 7.5cm PaK 40 and the development of shaped-charge anti-tank projectiles that could be fired from various 7.5cm and 10.5cm infantry guns and field howitzers.

This caliber of gun resurfaced yet again in 1944 due to the advent of the Volksgrenadier division. These units were intended strictly for defensive missions and their weaponry leaned toward low-cost substitutes. One of its light artillery battalions was supposed to be armed with the notional 7.5cm FK 40 instead of the usual 10.5cm leFH howitzers. This was intended to be a hybrid anti-tank/light field gun. The first version was the 7.5cm FK 7M85, consisting of a 7.5cm KwK 42 gun barrel on the carriage of the 10.5cm leFH 18/40. Only ten were built in 1944. Instead, production shifted to the 7.5cm FK 7M59 that was simply a 7.5cm PaK 40 anti-tank gun with the trunnion modified to increase elevation to 35 degrees to permit indirect artillery fire. Only 20 were built in 1945. The KStN for the 1945 infantry division also adopted this weapon, in spite of the fact that there was practically no supply of such field guns. These units inevitably ended up with expedients such as normal 7.5cm PaK 40 anti-tank guns, or various war-booty types.

Backbone of the artillery: the 10.5cm light field howitzer

By 1918, the German army had started to shift from 7.7cm field guns to 10.5cm FH 16 light field howitzers as the basis for divisional artillery. At the start of World War II in 1939, the Wehrmacht still had 496 10.5cm leFH 16, and these were used by more than a dozen infantry divisions formed in late 1939 due to a shortage of standard equipment.

The decision to switch from a field gun to a howitzer was based on artillery experiences in World War I. Flat trajectory field guns had a difficult time striking enemy infantry that was shielded by terrain features such as hills. A howitzer, with a selection of propelling charges, had a corresponding choice of trajectories that could bring fire on targets that would be completely shielded from field gun fire. The low muzzle velocity of the howitzer also allowed the use of a thin-walled projectile with double the high-explosive

B

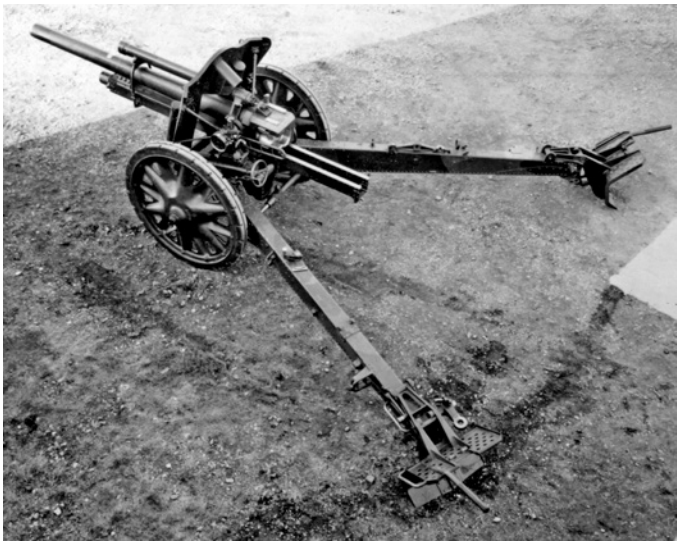
MOVING THE DIVISIONAL GUNS

The 10.5cm leFH 18 family was normally towed by the Sdkfz. 11 3-tonne half-track Late in the war, the Wehrmacht began adopting the RSO (*Raupenschlepper Ost*: tracked prime mover – East) as a substitute. It was less expensive than the half-track, and there was hope that its fully tracked configuration would prove more suitable in muddy field conditions typical of the Russian Front. The RSO/03 version shown here in the upper illustration had a simpler cab with canvas top than the original pressed-steel body of the basic version.

The 15cm sFH 18 was generally towed by the Sd.Kfz. 7 half-track that had an 8-tonne capacity. To make the howitzer better suited for towing cross-country, the barrel was usually disengaged and placed fully to the rear as shown here in the lower illustration.

1

2



An excellent overhead view of the standard 10.5cm leFH 18 für Kraftzug in firing position with the trails extended and the soft-earth entrenching spades in place. This howitzer has the rubber-rimmed wheels for motorized towing.

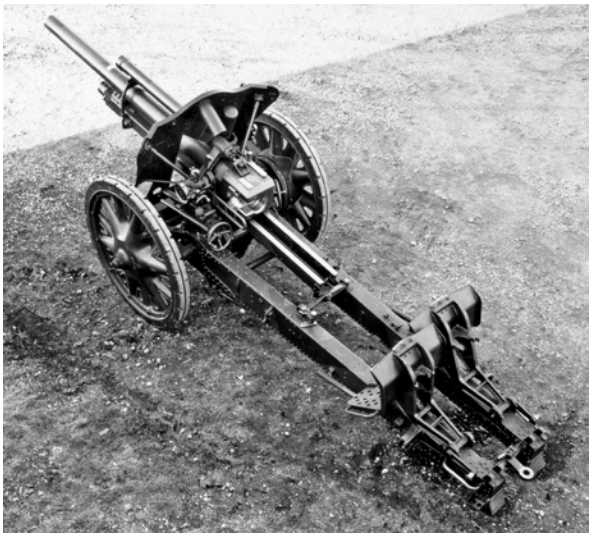
fill of that of the field gun. The choice of the 10.5cm caliber over 7.5cm also offered much better fragmentation effects. A German study found that at medium range, the effect of the 10.5cm was 6.33 times greater than that of the 7.5cm.

Rheinmetall began the development of a new 10.5cm field howitzer that underwent tests in 1928–34. The new type was accepted for serial production on July 26, 1935 as the 10.5cm leichte Feldhaubitze 18 (light field howitzer). The horse-towed 10.5cm leFH 18 (Bespg.) was provided with a caisson, the leichte Feldhaubitzeprotze 18. The first series of howitzers used a spoked wooden wheel similar to that on the 10.5cm leFH 16. In 1936, a more durable stamped metal wheel was introduced, made from light metals such as aluminum to keep down weight.

The "18" suffix in many German pre-war artillery designations was to camouflage the fact that they had been illegally developed in the 1920s and to pretend instead that they had been designed but not manufactured in 1918. The first combat use of the 10.5cm leFH 18 occurred in the late 1930s, when Germany exported small numbers to China during its war with Japan, and to Spanish nationalist forces in the Spanish Civil War in 1936–39.

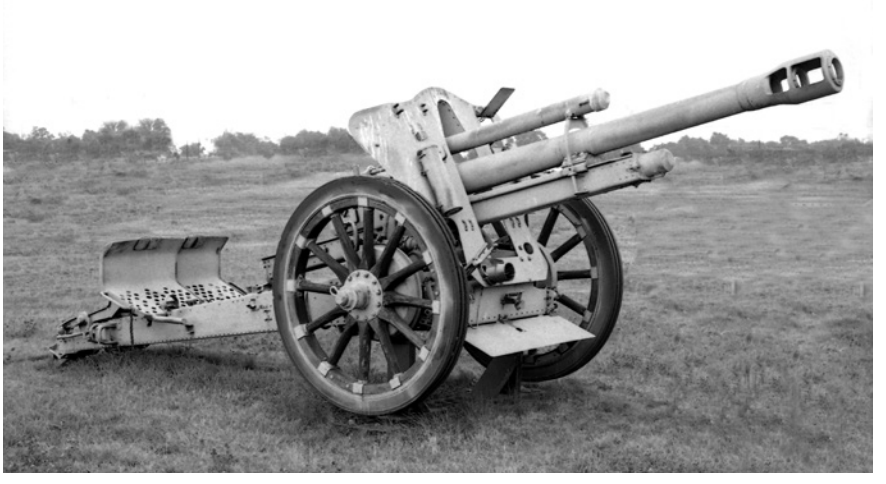
The 10.5cm leFH 18 became the most numerous and most important German field artillery type of World War II, and was produced in larger numbers than any other type. A total of 4,862 were manufactured by Rheinmetall-Borsig prior to the outbreak of the war, and at least 17,180 during the war, for a total of over 22,000. Although Allied soldiers often spoke of being bombarded by "88s," in most cases, it was this weapon.

A companion overhead view of a standard 10.5cm leFH 18 für Kraftzug in transport configuration with the trails locked together and the spades folded up on to the trails.



Development work continued at Rheinmetall, including design of an extended-range version. By adding a muzzle brake and improving the recuperator to increase the maximum pressure from 54 to 60 atmospheres, the existing gun could use a larger propellant charge. These features increased the maximum range from 10.7km to 12.3km. This version entered production in 1940 as the leFH 18M, the "M" indicating *Mündungsbremse* – muzzle brake. Some older 10.5cm leFH 18 were upgraded to this standard during the war.

In March 1942, the HWA issued a requirement for a version mounted on a lighter carriage to reduce weight and lower the cost. This version combined the gun assembly of the leFH 18M with the carriage of the 7.5cm PaK 40 anti-tank gun, resulting in the 10.5cm leFH 18/40. At the same time, the muzzle brake was redesigned to further reduce recoil pressures.



The 10.5cm leFH 18M introduced a new muzzle brake to enable the gun to employ more powerful propellant charges for greater range. This example is a für Kraftzug version for motorized towing with rubber-rimmed wheels. The spoked wooden wheels were one of several variations used on this gun during its manufacture.

Production of this version began in March 1943, although the 10.5cm leFH 18M remained in production at some factories until the war's end. Total production of the 10.5cm leFH 18/40 version was at least 10,245, or slightly less than half the total production of this howitzer.

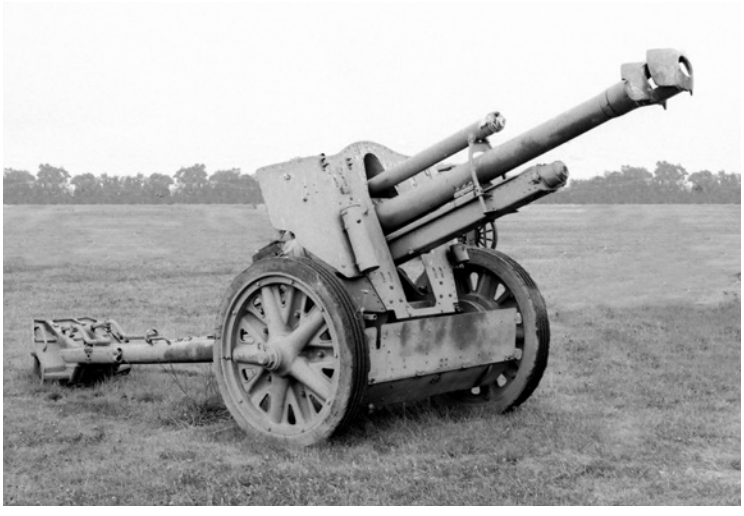
Curiously enough, versions of the 10.5cm leFH 18/40 were planned using war-booty Soviet howitzer carriages instead of the 7.5cm PaK 40 carriage. These included Gerät 5-1066 on the 12.2cm sFH 396(r) (122mm M-30 light howitzer) and the Gerät 5-1067 on the 15.2cm sFH 445(r) (152mm Model 09/30 howitzer). A total of 800 of these conversions were ordered in late 1944, and at least 150 were completed by February 1945. It is unclear how many were built prior to the war's end.

Further development work continued in 1941–42, but the new variants did not enter production. In 1942, the HWA issued a requirement for a new light field howitzer mounted on a cruciform turntable capable of 360-degree traverse, but it did not enter series production due to the low priority afforded artillery compared with the Panzers during this period.

10.5cm gun battery organization

The essential tactical unit for the German divisional artillery regiment was the horse-drawn light field howitzer battery (*leichte Artilleriebatterie für Bespannug*). This unit was based around four 10.5cm leFH 18 howitzers and included four officers, 30 NCOs, 137 enlisted men, 153 horses, and 16 towed wagons.

The command element of the battery was the Battery Troop (*Batterie-Trupp*) organized into three squadrons (*Staffeln*). Staffel I was the horse-mounted command element, including the commander and his immediate staff. Staffel II and Staffel III were VB squadrons (*Vorgeschobenen Beobachter*: forward observer), each including a mounted observer and two communication soldiers plus their supporting personnel. Separate from the Battery Troop was a Signal Squadron (*Nachrichten Staffel*) that included the battery's observation officers, fire-direction officers, and ballistic-calculation team. The Signal Squadron was transported on a general-purpose leichte Feldwagen Hf.2 and a special-purpose observation wagon (*Beobachtungswagen* Af. 12) that carried the equipment needed by the squadron.



The 10.5cm leFH 18/40 transferred the gun to the carriage of the 7.5cm PaK 40 anti-tank gun. This version introduced an enlarged muzzle brake to reduce recoil forces on the lightened carriage. This is the version for motorized towing.

Each Gun Squadron (*Geschütz-Staffel*) included two gun-platoons (*Züge*) each with two 10.5cm leFH 18 field howitzers along with the associated horse teams, caissons, platoon leaders, and horse-masters. The squadron also included a twin MG 34 machine gun on a Zwillingsockel 36 mount, and carried in an If.5 machine-gun cart (*Maschinengewehrwagen*) intended primarily for anti-aircraft defense of the battery. Accompanying the Gun Squadron were two Ammunition Squadrons (*Munitions-Staffel I und II*) that each consisted of four Af. 4 Feldhaubitze Munitionswagen 98. Each wagon consisted of a caisson (*Protze*) and trailer (*Hinterwagen*), the latter of which carried 42 10.5cm rounds and their associated propellant cases. Each squadron was organized into two ammunition platoons. As a result, each battery could carry up to 336 rounds of ammunition, roughly 1.5 units-of-fire.

The service element of the battery consisted of four columns (*Troß*). The support column (*Gefechtstroß*) included three wagons: a field kitchen (*große Feldküche* Hf. 11), a light supply wagon (*leichter Feldwagen* Hf. 1/3), and a supply wagon (*Vorratswagen* Hf. 2). This column included the battery's repair troop (*Instandsetzungstrupp*) as well as the chief supply NCO, medic, weapons' specialist, and harness-master (*Schirrmeister*). There were two supply columns (*Verpflegungstroß*), each with a senior sergeant, a book-keeper, and an associated supply wagon (*Verpflegswagen* HF. 2). Finally, there was a baggage train (*Gepäcktroß*) on a single field cart (*Feldwagen*) that transported the battery craftsmen who were mostly responsible for caring for the battery's horses and their associated bridles and tack.

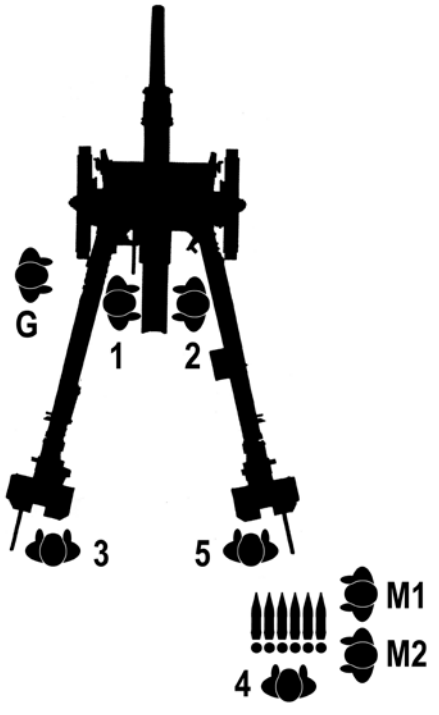
The light field howitzer battery underwent a number of organizational changes through the war, so that by 1945, it was a smaller and leaner organization with three officers, 27 NCOs, 86 enlisted men, 95 horses, and 16 wagons.

10.5cm leFH 18 operation

Tactical doctrine for the operation of the 10.5cm leFH 18 was set out in various training regulations (*Ausbildungsvorschrift*). The basic process changed in small details from pre-war regulations through the war. The horse-drawn howitzer crew consisted of nine men. The gun commander (*Gefechtsführer*) rode on a horse alongside the gun and horse team. On the six horses were three riders who stayed with the horse team through the engagement. On the caisson were five *Kanoniere* (gunners), who in the manuals were identified by the numbers 1 through 5 to identify their roles in the crew. The gun team was generally accompanied by a Munitionswagen that typically had a crew of eight, including three riders and five gunners on the caisson. These men were usually numbered M1 to M5 to distinguish them from the gun crew.

The gun commander deployed the 10.5cm leFH 18 based on the instructions of the battery commander. According to regulations, the battery's four howitzers were spaced in a line 20 paces (13m) apart, though in practice this depended on the circumstances and terrain. On reaching the deployment position, the gun crew left the caisson and unlimbered the howitzer. The horse team then withdrew at least 300m behind the guns to reduce the vulnerability of the horses to enemy fire; the three riders remained with the horses. The practice was the same when using a half-track prime-mover, with the driver moving the towing vehicle back from the gun position.

The traditional deployment pattern was to place the Munitionswagen on the right side of the howitzer to facilitate ammunition supply. If within sight of the enemy, this was a dangerous practice since the ammunition was not well protected. Later manuals recommended that the Munitionswagen deposit ammunition behind the right trail of the howitzer, and then withdraw. The 1938 regulations recommended placing the projectiles three paces (2m) behind the trails, and the propellant cases further behind them.



This illustration shows the standard crew drill for the 10.5cm leFH 18 based on the wartime training regulations. The gun commander is marked G (Gefechtsführer), the gunners 1 to 5 and the munitions crew M1 and M2.

The gun crew in the immediate proximity of the howitzer was eight men. The gun commander stood on the left side of the gun. Kanonier 1 and Kanonier 2 stood on the left and right of the breech respectively. Kanonier 1, also called the Richtschütze, was the most important member of the team, since he was responsible for aiming the gun using the Rbi. F. 32 (Rundblickfernohr 32) panoramic telescopic sight located on the left side of the gun. Kanonier 1 also operated the traverse wheel of the gun. Kanonier 2 on the right side of the gun operated the elevation wheel and the breech mechanism. He was responsible for firing the gun on the commander's instructions using a lanyard attached to the right side of the breech. Kanonier 3 was stationed behind the left trail and Kanonier 5 behind the right trail. They had two distinct functions. Their main role was to load the howitzer. First, Kanonier 3 would load the projectile; Kanonier 5 would pass him the propellant case which he would then load; and Kanonier 2 would ram home the round before closing the breech. If the target was beyond the limits of the howitzer's traverse, these two gunners would have to traverse the gun left or right by lifting the trails using the trail hand spikes.

There was a three-man team behind the right trail that prepared the ammunition. This consisted of Kanonier 4 from the gun team and two men from the Munitionswagen, gunners M1 and M2. There were three principal types of projectile: high-explosive, anti-tank, and smoke. These are shown in more detail in the accompanying illustration. The gun commander instructed the munitions team about the type of fuze to use.

There were two common types of fuzes for the standard high-explosive projectile. The AZ 23 fuze had two settings, impact or time delay. The impact setting (ov: *ohne Verzögerung* – without delay) detonated the projectile immediately upon impact and was generally used to attack enemy targets in the open. The delay setting (mv: *mit Verzögerung* – with delay) was typically

used against enemy troops in trenches since it allowed the projectile to penetrate the soil for a fraction of a second before detonating. It could also be used to ricochet off hard ground, in which case it would detonate overhead the target. The Dopp ZS/60 combination fuzes (*Doppelzünder*) were used as an impact fuze in their default setting, but they had an optional mechanical timer in the fuze. By precisely setting the time from firing to impact, the fuze could detonate the projectile overhead enemy troops, significantly increasing its lethality. This fuze was significantly more expensive than the ordinary impact fuzes, and so was issued in more modest quantities.

The 10.5cm leFH 18 ammunition used a separate propellant in brass or steel casings with five charge increments (*Ladung*). The use of all five increments was standard, but increments could be removed to reduce the range of the howitzer depending on the target. There was a special Ladung 6 providing very high muzzle velocity that could be substituted for the standard Ladung 5 for certain types of missions such as anti-tank.

The 10.5cm mountain howitzer

The 10.5cm leFH 18 was too large and heavy for use by the mountain divisions, and so in 1938, the HWA began development of a specialized 10.5cm mountain gun. Both Böhler and Rheinmetall offered designs. The Böhler design was accepted for service in 1942 as the 10.5cm Gebirgshaubitze 40. It used its own type of ammunition, the 10cm Granate 39 family. This gun was designed to be disassembled into four sub-assemblies that could be towed by SdKfz. 2 Kettenkrad tracked motorcycles. It was a relatively rare type, with only 418 manufactured during the war. Besides its use by the mountain divisions, it was also used by other specialized Heer formations requiring light-weight equipment such as the 91.Luftlande-Infanterie-Division (air-landing infantry division) that served in Normandy in 1944.

C

10.5CM AMMUNITION FOR LEFH 18

German artillery projectiles were color coded. Those painted field gray or olive green had a high-explosive filling; black was armor-piercing shot. The uppermost line of stencil included a large number that indicated the type of filling as described in more detail below. It was followed by smaller characters indicating the date and place of fuzing; e.g., Jg 3.7.42A. The large Roman numerals below this indicated the weight class, in this case III. There were a variety of specialized mid-body markings described below. The bottom line of stencil immediately above the rotating band indicated the date and location of the filling of the projectile. A red band and "rot" in the designation indicated that it was a high-velocity round requiring an appropriate charge.

High explosive fill numbers near nose

1: TNT pressed in blocks in a cardboard container with magnesium putty

14: Poured TNT filling

91: Cyclonite/wax pressed in blocks

95: Cyclonite/TNT/wax mixture pressed in blocks

Construction stencils on projectile body

FES: *Führung Sintereisen* sintered-iron rotating band instead of the usual copper band

KPS: *Kupfer Pressstahl*, a bi-metallic rotating band instead of ordinary copper

Lm *Duplex-Sprengkapsel* with both a nose and base fuze

Nb: *Nebel*, smoke

R11: Rauchentwickler Nr. 11, containing a Nr. 11 box that emitted a red smoke burst on impact

STG *Stahlgussgranate*, a cast-steel shell body

Key

a. FH Gr mit AZ 23v (0.15) high-explosive projectile fitted with an AZ 23 v with the "v" suffix indicating *mit Verzögerung*: with delay of 0.15 seconds.

b. FH Gr mit Dopp Z. This is a standard high-explosive projectile fitted with a Doppelzünder ZS/60 combination fuze.

c. FH Gr 38 FES mit AZ 23v (0.15) high-explosive projectile.

d. FH Gr Nb 38 mit kl AZ 23 Nb smoke projectile.

e. Gr 39 rot Hl mit AZ 38. Initial type of Hohlgranate shaped-charge projectile with 63mm armor penetration.

f. Gr 39 rot HL/A mit AZ 38. Shaped-charge projectile with 80mm armor penetration.

g. Gr 39 rot HL/B mit AZ 38. Shaped-charge projectile, with 90mm armor penetration.

h. Gr 39 rot HL/C mit AZ 38. Shaped-charge projectile, with 100mm armor penetration.

i. Sonderkartusche 6. The special Ladung 6 (Zone 6) charge intended for high muzzle velocity when using certain projectiles such as the armor-piercing projectiles.

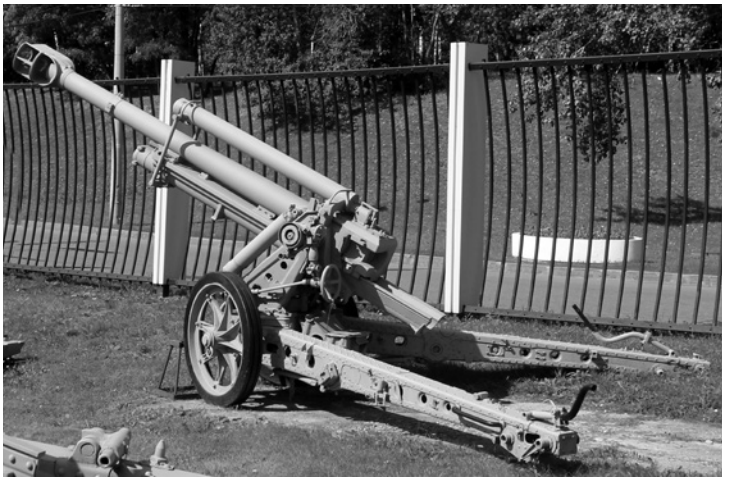
j. F.Kartusche. This was the enlarged charge for use with the 10.5cm leFH 18M and FH 18/40 for extended range, the "F" indicating Fern.

k. Kartusche 5. The basic Ladung 5 (Zone 5) charge for the 10.5cm field howitzer that contained five charge increments (*Ladung*).

l. Pzgr. mit BD Zf. f.10 cm Pzgr. This was the initial type of armor-piercing (AP) projectile that contained a base fuze with a small high-explosive fill of TNT with PETN/wax as the exploder.

m. Pzgr. rot mit BD Zf. f.10 cm Pzgr. This was an improved APCBC armor-piercing capped/ballistic cap projectile with an Ethylenediamine dinitrate/cyclonite/wax filling.

n. Weiß rot Geschoß mit Dopp Z. This was a base-ejecting propaganda shell, fitted with a combination fuze and filled with a thick roll of propaganda leaflets. These propaganda shells were traditionally painted white/red, hence the name of the projectile. The large 1 on the sides of the projectile indicated the particular type of leaflet.



The 10.5cm Gebirgshaubitze 40 was a sophisticated design used by German mountain artillery batteries and those of other specialist formations such as the air-landing divisions. It was developed by the Austrian firm Böhler that specialized in mountain artillery. It was the heaviest and most powerful dedicated mountain gun of World War II.

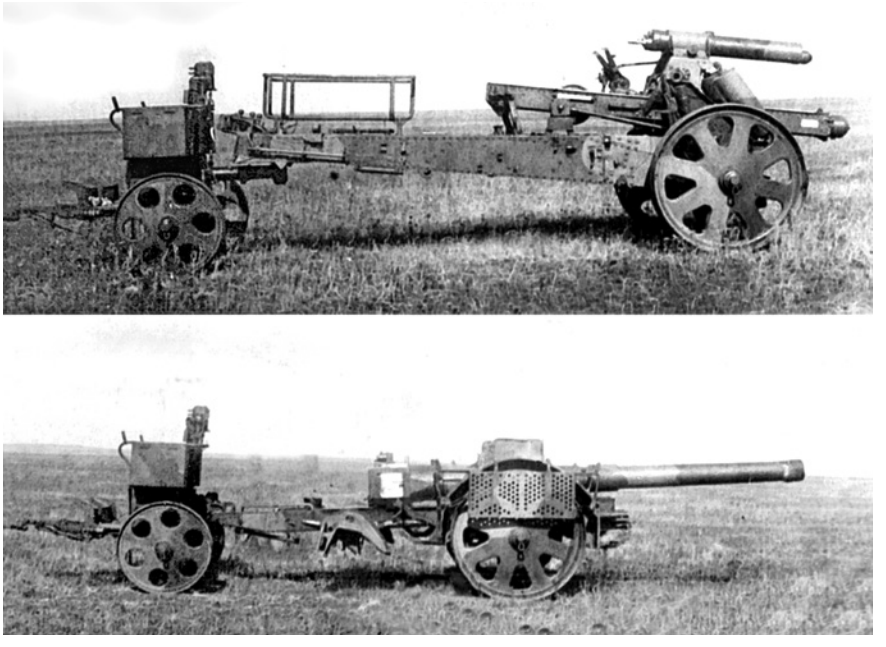
The 15cm heavy field howitzer

The second of the major divisional field guns was the 15cm schwere Feldhaubitze 18. This was a joint development, with Krupp designing the gun tube and Rheinmetall-Borsig responsible for the carriage and accessories. The program started in 1925, and the 15cm sFH 18 was accepted for army use on May 23, 1935. It was a modern design, especially when compared with the 15cm lang sFH 13 of World War I.

In the usual fashion, it was built in two versions for horse and motor traction. The complete weapon weighed 5.5 tonnes in firing position, which was too heavy for normal horse traction. As a result, the 15cm sFH 18 (Bespg.) version was broken down into two loads for horse towing, with the barrel being carried on a two-axle transport wagon and the carriage towed using a caisson. It took 20 minutes to reassemble the weapon after arriving at the firing position. The motorized 15cm sFH 18 für Kfz. was towed as a single load with a limber under the rear of the trails. Further evolution of the weapon continued, with the most significant derivative being the 10cm schwere Kanone 18, detailed below.

The lengthy process of emplacing the horse-towed 15cm sFH 18 led the HWA to contract Krupp and Rheinmetall to develop a lighter version that could be towed in an assembled configuration by a single horse team. This 15cm sFH 36 shortened the barrel from L/29.5 to L/24, and added a multi-baffle muzzle brake to reduce the recoil. Only a small number were manufactured up to 1941 since the shorter gun tube inevitably reduced the

A 15cm sFH 18 in firing position with its Kraftzugprotze limber behind it. This is actually a demonstration of captured equipment in Washington in 1944. Behind it is a Tiger tank captured in Tunisia in 1943.



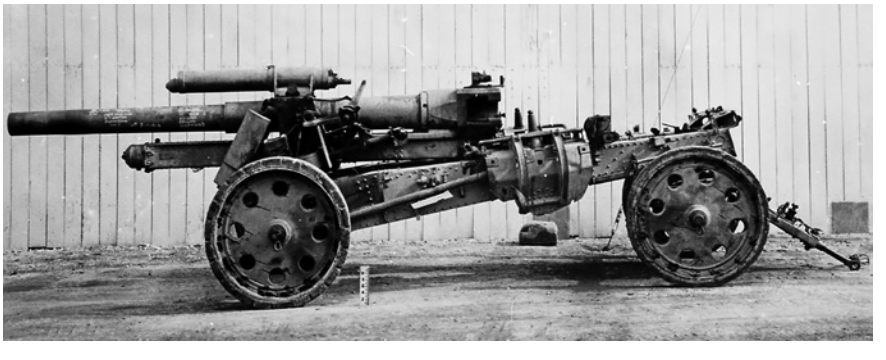
The 15cm sFH 18 für Bespannung disassembled the howitzer into two loads to make them light enough for horse traction. The upper view of the Laffetenwagen assembly shows the carriage and its associated Protze (caisson), while the lower view shows the AF. 19 Rohrwagen for the barrel along with its associated Pferdezugprotze caisson.

howitzer's range, already a problem when used in counter-battery missions against some Soviet guns.

The next evolutionary step was to increase the range of the 15cm sFH 18 by using a longer L/32.5 barrel with a muzzle brake. Although the design was successful, production halted after only 14 15cm sFH 18/40 were completed in 1941 due to the great demand for the basic model. Combat use of the 15cm sFH 18 on the Eastern Front in 1941 made it clear that the 15cm sFH 18 could be out-ranged by certain Soviet guns. As a result, a further 35 guns with lengthened barrels were built in early 1942, redesignated as the 15cm sFH 42. This type was apparently not successful, and production quickly ended in favor of other alternatives such as the 17cm gun.

Škoda had produced a very modern 15cm field howitzer immediately before Germany's annexation, and the Wehrmacht adopted the 118 that had been built. In 1940, the HWA awarded Škoda a contract for 60 more, but there was no further acquisition for the Wehrmacht after this.

In late 1943, the HWA issued a specification for a 15cm heavy howitzer on a Rundumfeuer cruciform mount, but it only reached the wooden mock-up stage by war's end.



A 15cm sFH 18 für Kraftzug in travel configuration with the barrel locked down in full recoil position, the wheeled limber under the trails, and the recoil spades attached to the sides of the trail.

Divisional artillery technical data				
Type	**10.5cm leFH 18**	**10.5cm leFH 18/40**	**10.5cm Geb H 40**	**15cm sFH 18**
Caliber	L/28	L/28	L/30	L/29.5
Length (m)	6.1	6.15	5.6	7.85
Width (m)	1.98	2.11	1.36	2.25
Height (m)	1.88	1.83	1.57	1.7
Weight (kg)	2,040–2,065	1,900	1,656	6,304
Elevation (degrees)	-8 to +42	-8 to +42	-5 to +70	-3 to +45
HE projectile weight (kg)	14.8	14.8	14.8	43.5
Muzzle velocity (m/s)	470	540	570	520
Rate of fire (rpm)	4–6	4–6	4–6	4
Max. range (km)	10.7	12.3	12.6	13.3

German field artillery production 1939–45								
	1939	**1940**	**1941**	**1942**	**1943**	**1944**	**1945**	**Total**
Infantry artillery								
7.5cm leIG 18	290	850	1,115	1,188	1,946	3,099	549	**9,037**
7.5cm IG 37						2,278		**2,278**
7.5cm IG 42						258	269	**527**
7.5cm Geb G 36	59	70	84	216	242	456	56	**1,183**
15cm sIG 33	48	310	492	420	719	1,378	387	**3,754**
Divisional artillery								
7.5cm leFK 18	8	96						**104**
7.5cm leFK 38 L/54				80				**80**
7.5cm FK 7 M85						10		**10**
7.5cm FK 7 M59							20	**20**
10.5cm Geb H 40				30	104	223	61	**418**
10.5cm le FH 18 &18M	483	1,380	1,160	1,237	1,714	1,029	150	**7,153**
10.5cm le FH 18/40					1,872	7,807	566	**10,245**
15cm sFH 18	190	580	516	636	785	2,498	489	**5,694**
15cm sFH 18/40 & 42			14	35				**49**
15cm sFH 37(t)		60						**60**
GHQ artillery								
10cm K 18	8	35	108	135	454	669	100	**1,509**
15cm K 18		21	45	25	10			**101**
10cm s K 35 (t)		38						**38**
15cm K 39	15	11	25	13				**64**
15cm in Mors. Laf		8						**8**
17cm in Mors. Laf.			91	126	78	41	3	**339**
21cm Mors 18	58	275	167		95	104	8	**707**
21cm Gr W 69							66	**66**
Total	**1,159**	**3,734**	**3,817**	**4,141**	**8,019**	**19,850**	**2,724**	**43,444**

GHQ artillery

10cm gun

As mentioned before, a long-range version of the divisional 15cm sFH 18 was developed alongside it as the 10cm schwere Kanone 18. It was accepted for service in 1935 and produced through to the end of the war for use in the GHQ artillery; Panzer divisions had a battery of four. It had a longer L/52 barrel giving it a maximum range of 19km compared with 13.3km for the 15cm version. A total of 702 of these were available at the start of the

war, and modest production continued through the war years, totaling 1,515 guns. An improved version, first called the 10cm K 18/40 and later the 10cm K 42 was developed in 1941. This used a longer L/60 barrel and a modified recoil system. Production of this version began in 1943.

The 10cm schwere Kanone 18 was based on the same carriage as the divisional 15cm sFH 18 but used a much longer L/52 gun barrel to provide it with increased range for counter-battery fire. This example was captured by the US Army in France and was put back to use during the Metz campaign in October 1944 by the 344th Field Artillery Battalion, 90th Division.

12.8cm K 81 gun

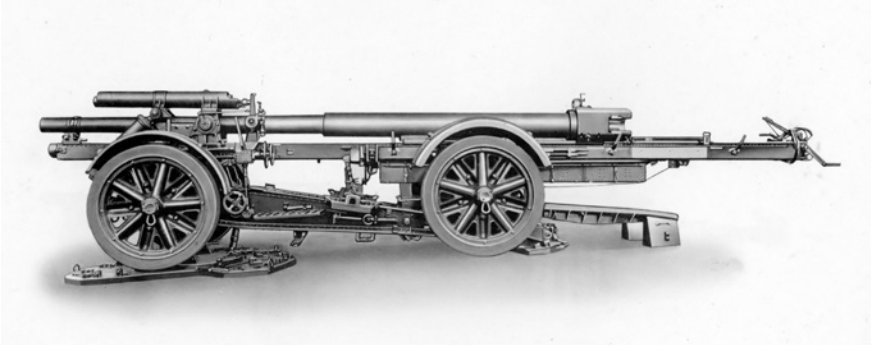
In January 1944, the OKH established a requirement for a 12.8cm gun to replace the 10cm gun for counter-battery fire. The 12.8cm caliber was selected since ammunition in this caliber was already in production for Flak and naval applications. The army also had a requirement for a 12.8mm anti-tank gun, which was first manifest in the gun for the new Jagdtiger tank destroyer. As a result, development of the anti-tank and field guns occurred concurrently, sharing a common gun tube. Both Rheinmetall and Krupp produced prototypes of a 12.8cm PaK gun on a massive cruciform mount. This was excessive for a field gun, so it was decided to mount the first production batches on war-booty gun carriages: the Kanone 81/1 on the French 155mm GPF-T carriage and the Kanone 81/2 on the Soviet 122mm A-19/152mm ML-10 carriage. An order was placed for 150 guns to equip six batteries in time for the Ardennes offensive in December 1944.

15cm guns

Germany employed the 15cm K 16 gun in World War I and 28 remained in service in 1939. Additional examples were captured from Belgium, which had received them as war reparations. In order to provide an immediately available counter-battery gun, some K 16 barrels were adapted to the 21cm Mörserlafette. A similar improvisation was the 15cm Schiffskanone C/28 in Mörserlafette that used the same carriage but with the 15cm naval gun barrel. Only eight were converted.

The 12.8cm Kanone 81/2 used the carriage of the Soviet 122mm A-19 gun/152mm ML-10 corps gun/howitzer. It was intended to serve as a corps-level counter-battery gun, and 150 were ordered for use in the 1944 Ardennes offensive.

German heavy field guns had their barrels moved to a Rohrwagen for towing due to their weight and length. The process is seen here with the 15cm K 18 with the Rohrwagen positioned at the rear of the carriage and the barrel slid backwards.



Rheinmetall had begun the development of a 15cm gun in 1933 to replace the old 15cm K 16. It employed some novel features such as a two-piece turntable to facilitate traverse. Production was belated and slow, with only three of the 15cm K 18 in service at the war's outbreak. Production continued through 1943, bringing the total to 104 guns. Rheinmetall developed a similar weapon based on a Turkish export order. The Wehrmacht decided to requisition these after the start of war under the designation 15cm K 39, with only 64 completed.

17cm gun K 18 in Mörserlafette

Arguably the best of the German heavy guns, the 17cm K 18 was another weapon based on Krupp's 21cm Mörserlafette. Development began by Krupp in 1941 due to the army's concern that some of the existing 15cm field guns were not adequate in the counter-battery role. This gun used a very long L/50 gun barrel that provided the weapon with a 28km maximum range. The complex Mörserlafette carriage is described in more detail below. Production began in 1941, three years after the 21cm Mörser 18. Only 339 were manufactured by the end of the war and served in about 70 heavy artillery batteries, each with three guns.

21cm Mörser 18

At the start of the war, the Wehrmacht had 28 of the old Langer 21cm Mörser in service, equipping six battalions. Krupp began designing a replacement in 1933 that incorporated a much longer barrel and a very sophisticated and innovative carriage. It was designated as a mortar in the German army due to its exceptional elevation – a maximum of 70 degrees. This weapon would have been classified as a heavy howitzer by most other armies. The exceptional elevation enabled the weapon to lob concrete-penetrating and armor-penetrating rounds to high altitudes, giving it greater penetrating power against fortifications such as the Maginot Line. The elaborate

D

15CM SCHWERE INFANTERIEGESCHÜTZE 33 WITH STIELGRANATE 42

Besides using conventional ammunition, the 15cm sIG 33 could employ a specialized demolition projectile, the Stielgranate 42. The projectile was mounted externally on the bore end of the gun and propelled by a charge inside the tube. Although this unusual design resembled specialized anti-tank rounds developed for other guns, it was in fact intended for blowing gaps in barbed-wire defenses or for use against concrete defenses. It offered more than double the firepower of the conventional high-explosive round: 90kg vs. 38kg, but less than quarter the range, 1km vs. 4.7km.

A 17cm K 18 in Mörserlafette being inspected by a member of the US 35th Infantry Division after being abandoned in Rheinberg, Germany, in early March 1945. This gun was supposed to be broken down into two loads for towing but, out of desperation, was sometimes towed without dismounting the barrel.

recoil system is described in detail in the accompanying illustration.

Due to its deployed weight of 16.7 tonnes, it was transported in three loads. Production began in 1939 and 22 had been produced by the start of the war. They were deployed in schweres Artillerie-Abteilung under the Heeres-Artillerie. In its original organization, these battalions had two batteries, but in 1940, a three-battery configuration was introduced with nine 21cm M 18. Six of these battalions were in service during the Battle of France in 1940. By the time of the invasion of the Soviet Union in 1941, this had increased to 19 battalions. At the start of 1944, there were 26 battalions and five batteries equipped with this weapon. As mentioned previously, the innovative carriage was used for other heavy guns, most notably the 17cm K 18.

21cm Kanone

Krupp began development of the 21cm K 38 in 1938 as a potential replacement for the 21cm M 18 since it could offer a much greater range – 34km vs. 18.7km. It was a completely new design, using an entirely different carriage and a long 21cm barrel of L/55. The HWA ordered 15 in 1940, but it was a complex and extremely expensive weapon. Only eight were completed by 1943, of which one was sold to Japan.

Škoda was developing a similar weapon, the 21cm Kanon K 52, mainly for the export market, and received a contract from Turkey in 1938. Two of these were delivered prior to the German take-over, but the remainder of the ten on order were taken over by the Wehrmacht as the 21cm K 39. Additional German orders followed, including 20 of the improved 21cm K 39/40. Only two artillery battalions used these as field artillery with the rest being used for coastal defense. Sweden ordered nine of these during the war where they were used for coastal defense. A further 40 improved 21cm K 9/41 were ordered in 1944 but only 16 were completed by war's end.

The 21cm Mörser 18 used a separate Rohrkarren barrel carriage to transport the barrel during transit, usually towed by the Sd.Kfz. 8 half-track.

For transport, the 21cm Mörser 18 had the gun barrel removed and the carriage and gun cradle towed separately as a Lafettewagen, as seen here.

Heavy artillery technical data				
Type	**10cm K 18**	**15cm K 18**	**17cm in Mors. Laf.**	**21cm Mors 18**
Caliber	L/52	L/55	L/50	L/31
Length (m)	8.18	11.9	12.8	12.8
Width (m)	2.25	2.59	2.83	2.83
Height (m)	1.7	2.75	3.11	3.11
Weight (tonnes)	6.4	18.7	23.4	22.7
Elevation (degrees)	+45	-2 to +43	+50	+70
HE projectile weight (kg)	15.1	43	68	121
Muzzle velocity (m/s)	835	865	860	565
Rate of fire (rpm)	6	2	1–2	1
Max. range (km)	19.0	24.8	28	18.7

Beutegeschütze

The Wehrmacht captured enormous stocks of field guns and ammunition during the Blitzkrieg era of 1939–41. By 1943, the Wehrmacht had refurbished and deployed over 30,000 war-booty artillery pieces including mortars, anti-tank guns, Flak, and other types. To put this in perspective, the German field artillery arsenal at the end of 1941 was only about 18,000 field guns.

Germany acquired the modest Austrian arsenal of field guns during the Anschluss of May 1938. The first significant acquisition was the Czechoslovak arsenal that included many weapons manufactured for the Austro-Hungarian army in World War I, mainly by the famous Czech firm Škoda. A total of 1,183 Czechoslovak field guns, howitzers, and heavy mortars were in German service at the start of the war in 1939. At the time of the 1940 Battle of France, 11 German infantry divisions were equipped with Czech field guns. The inventory of Austro-Hungarian and Czech export guns increased with the capture of the Polish and Yugoslav arsenals. The Škoda plants continued to manufacture artillery for the Wehrmacht, gradually shifting to German designs.

The 1,596 field guns captured from Poland in 1939 came from multiple sources and included French, Russian, and Austro-Hungarian field guns. The main problem with many of these weapons was that only about a hundred

A fine study of a 21cm Mörser 18 on display in firing position with the Kraftzugprotze limber behind it. This is actually a demonstration of captured equipment in Washington, DC in 1944. Notice the Japanese Type 95 light tank in the background.

tonnes of artillery ammunition was secured after the 1939 campaign.

The defeat of France in 1940 led to the capture of a very large, though somewhat outdated arsenal. The single largest number of French field guns was about 4,000 75mm M1897, of which 2,440 came from France, 860 from Poland, and the rest from various other countries. These were seldom used as field guns as they were viewed as too antiquated. Initially, several hundred were turned over to the Luftwaffe and Kriegsmarine for secondary roles. Many were returned to the army in 1942 for conversion into the 7.5cm PaK 97/38 anti-tank gun. Over 3,700 of these conversions were produced in 1942–44.

The two most widely used French guns employed as field artillery were the Schneider 155mm howitzer and the 155mm GPF gun (*Grande Puissance Filloux*: Filloux High Power), with about 1,800 Schneiders and 1,200 GPF having been captured intact. For example, at the beginning of 1944, there were 662 French field guns in service on the Eastern Front.

The increasing arsenal of foreign weapons led the Wehrmacht to establish basic criteria for artillery that could be issued to the *Feldheer* (Field Army) or limited to secondary roles such as training in the *Ersatzheer* (Replacement Army). For field army use, the rule of thumb was that the captured ammunition supply had to amount to 30 units-of-fire (*Munitions Ausstattung*) per gun. The unit-of-fire for infantry guns and light field howitzers was 250 rounds, and for medium field howitzers it was 150 rounds. This significantly reduced the number of gun types suitable for field use, and the remaining types were put in war reserve or issued to training and security units.

This policy evolved during the course of the war for several reasons. Hitler's 1942 plan to erect the Atlantikwall coastal defenses greatly increased

Many war-booty French artillery pieces were used for coastal defense such as this Schneider Canon de 155 L mle. 1917, known as 15.5cm Kanone 416(f) in Wehrmacht service. It is seen here on September 17, 1942, on the Finnish island of Tytärsaari in the Baltic about 200km west of Leningrad. Of the 340 in German service, 299 were assigned to coastal defense. (SA-kuva)

The French Canon de 155 GPF was widely used in German service as the 15.5cm Kanone 418(f). In early 1944, there were 221 in service, of which 207 were used for coastal defense. This is a relatively rare example of one being used in Italy in February 1944 in a field gun role against the Anzio bridgehead.

the need for large quantities of artillery. Although the Kriegsmarine had traditionally been assigned the coast defense role, the army gradually took over much of this mission with the establishment of coastal defense artillery regiments under the Heeres-Artillerie. This was an obvious use for Beutegeschütze, and so captured artillery became the backbone of German coastal defense. In total, more than 1,175 coastal artillery batteries were organized by the Heer during the war, not counting those formed by the Kriegsmarine. The Kriegsmarine primarily used naval guns for its coastal batteries, both German-built and war-booty types.

For the coast defense role, the HWA established a requirement of at least ten units-of-fire for a gun to be considered sufficient for this role. Gun types with smaller ammunition inventories were sometimes assigned as "surf guns" (*Brandungsartillerie*), that is, weapons placed along the shore to fight landing craft.

The Wehrmacht captured large quantities of Soviet artillery in 1941. Aside from some impromptu use by combat units, most of this ended up in war reserve for the first years of the war. There were some exceptions, such as the 76.2mm F-22 divisional gun that was used as an expedient anti-tank gun and the 76.2mm regimental gun used as a substitute for German light infantry guns. Starting in 1942, large numbers of Soviet guns were assigned to coast defense, especially to the Atlantikwall. The 1943 artillery crisis led to more widespread employment of Soviet field guns. This was especially the case for the more modern and powerful types, such as the 122mm M-30 howitzer, 122mm A-19 corps gun, and the 152mm ML-20 gun-howitzer. Germany began manufacturing ammunition for several types of Soviet guns in 1943.

When Italy withdrew from the Axis alliance in September 1943, its substantial arsenal fell into German hands. Most of these weapons remained in place in Italy, the Balkans, and France's Mediterranean coast, where they had originally served in the Italian army.

In March 1944, the Wehrmacht deployed about 18,700 field guns, of which about 10,300 were of German origin and 8,400 were Beutegeschütze.

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10.5CM LEFH 18 BATTERY IN COMBAT, RUSSIA, SUMMER 1941

German artillery batteries were trained to fight in a mobile fashion, reducing their vulnerability to counter-battery fire. The gun battery could be deployed in an open firing position in direct sight of the enemy or in a covered firing position, often on the reverse slope of a hill, using indirect fire. This shows a typical field deployment although the guns are displaced more than the recommended 20 paces (13m) apart.

Inevitably, the battlefield could stagnate and the gun battery could be emplaced in an earthen field work. The recommended gun pit was usually 400cm deep, 5m wide and 6m long with trenches and dugouts for the crew and ammunition. Such a gun pit took about 110 man-hours to construct, roughly one day's work for ten men.

One of the more popular war-booty Soviet guns was the 76.2mm F-22 USV Obrazets. 1939 divisional gun. The HWA upgraded these guns with a German muzzle brake and issued them to German units as the 7.62cm Feldkanone 297(r). This one was captured by the US Army in the July 1943 campaign on Sicily.

At this point, war-booty artillery constituted about 45 percent of the active German arsenal. Of the German weapons, only about 5 percent were deployed in army coastal defense units, while more than half of Beutegeschütze were used in this role. The importance of Beutegeschütze varied enormously between theaters. For example, on the Eastern Front, only about 19 percent of the field guns were of foreign origin, while in France, 77 percent were Beutegeschütze due to the large number of guns committed to the Atlantikwall.

The accompanying chart here shows the employment of Beutegeschütze field artillery in early 1944, broken down between the field army and coastal defense units. This chart does not include other types of Beutegeschütze such as mortars, anti-tank guns, and Flak. It also does not include field guns in secondary roles such as training with the Ersatzheer in Germany, or in war reserve.

Beutegeschütze field artillery inventory, March 1944

Country of origin	No. of types	Field army	Coastal defense	Total
France	24	1,443	2,009	**3,452**
Italy	27	728	695	**1,423**
USSR	12	938	467	**1,405**
Czechoslovakia	16	491	281	**772**
Belgium	6	27	408	**435**
Yugoslavia	10	148	148	**296**
Netherlands	2	44	156	**200**
Poland	5	142	52	**194**
UK	7	87	27	**114**
Norway	4	57	49	**106**
Greece	2	0	4	**4**
Total	***(115)***	**4,105**	**4,296**	**8,401**

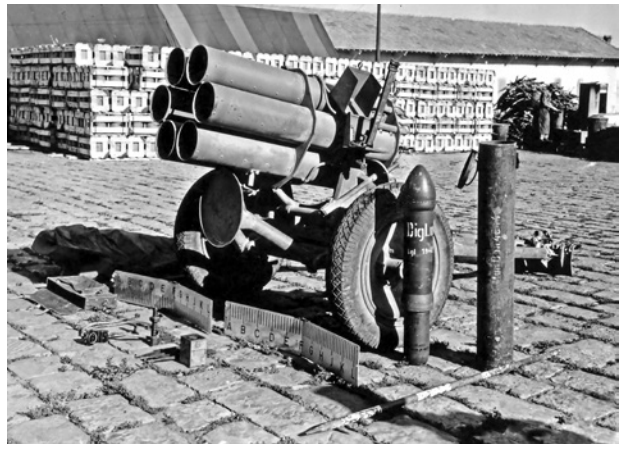
The crew of a 15cm Nebelwerfer 41 load a 15cm Wurfgranate 41 projectile during fighting in the eastern Beskid Mountains in southeastern Poland in November 1944.

Rocket artillery

The Reichswehr began forming *Nebeltruppe* (Smoke Troops) in 1929 for the delivery of chemical weapons and smoke screens. Early projectiles relied on simple black-powder rockets. By the late 1930s, the idea emerged to use rocket barrages to deliver high-explosive rocket projectiles as well as chemical and smoke rounds. Development of the first successful weapon, the 15cm Nebelwerfer 41, began in 1934 under the direction of Oberst Walter Dornberger at HWA. Dornberger is better known for his management of Germany's A-4 (V-2) ballistic missile.

The Nebelwerfer were organized in regiments much the same as field artillery. These were usually subordinated to the Heeres-Artillerie and so were nearly always motorized. As in the case of the field artillery, the Wehrmacht began forming

Werfer brigades in late 1943 and early 1944, intended to further concentrate Nebelwerfer firepower. These generally included three battalions (12 batteries) with a total of 72 15cm Nebelwerfer and one or two battalions (six batteries) with 36 21cm Nebelwerfer. They came in both fully motorized and semi-mobile configurations.



A 15cm Nebelwerfer 41 captured by the US Army in Tunisia in 1943. The rocket next to it is a 15cm Wgr 41 Spreng high-explosive projectile with the steel transport container to the far right.

15cm Nebelwerfer 41

The first and most successful German rocket artillery projectile was the 15cm Wurfgranate. Its principal innovation was the use of multiple exhaust venturis rather than a single exhaust chamber. These imparted spin, thereby making the usual fins unnecessary. This made it much more convenient to fire it out of a simple tubular launcher. The layout of the 15cm Wurfgranate was unusual in that the rocket motor was at the front of the projectile, with the exhaust venturis in a ring around the middle. The warhead was contained in the rear of the projectile behind the rocket motor. The initial production versions of the 15cm Wurfgranate 41 used black powder, but improved propellants such as diethylene glycol dinitrate were developed and introduced during the course of the war to reduce the smoke trail of the rocket. Three basic types of projectiles were built in large numbers: high-explosive (*Spreng*), smoke (*Nebel*), and chemical (*Chemische*). Three different chemical types were manufactured but not used during the war.

The launcher for the 15cm Wurfgranate was the 15cm Nebelwerfer 41, sometimes called a DO Werfer, possibly referring to Dornberger. This was a very simple device based on the carriage of the 3.7cm PaK 36 anti-tank gun with an enlarged trunnion fitted with six launch tubes. A folding stabilization pad was added to the front of the carriage to provide a steadier platform when launching the rockets. The rockets were ignited electrically, and all six rockets could be ripple-fired in sequence in five seconds. Manufacture began in 1940 and by the end of the war 5,769 had been built, making it numerically the most significant type of Nebelwerfer during the war.

The first unit equipped with this weapon, Nebelwerfer-Regiment 51, was formed in October 1940. Initially, Nebelwerfers were mainly deployed with the Heeres-Artillerie to reinforce conventional artillery units, and so were motorized.

The 21cm Nebelwerfer 42 was similar in appearance to the earlier 15cm Nebelwerfer 41, but with five launch tubes rather than six.

The role of the Nebelwerfer shifted once it began to see combat use, favoring the use of high-explosive rockets over smoke. When first introduced into combat on the Eastern Front in the summer of 1941, it was highly praised for attacking massed Soviet infantry in foxholes or forested areas. By 1942, a Nebelwerfer unit would usually carry a mix of 80 percent high-explosive and 20 percent smoke projectiles. The rockets suffered from significant dispersion compared with conventional artillery. Roughly half of the rockets fired would strike in an area

A 30cm Nebelwerfer 42 of schwere Stellungs-Werfer-Regiment.101 captured by the US Army in Normandy and being inspected by US ordnance troops on June 15, 1944.

130m deep and 80m wide around the aimpoint. However, a Nebelwerfer unit could deliver an exceptionally large volume of fire in a short space of time. Therefore, it was used to supplement standard field artillery rather than replace it. There were concerns about the vulnerability of Nebelwerfers to Soviet counter-battery fire due to their obvious smoke plumes. This proved to be less serious in practice due to poor Soviet counter-battery practices.

A self-propelled launcher for this rocket was developed in 1942–43 on an armored Opel Maultier half-track as the Panzerwerfer 42; 240 were built in 1943–44. The Waffen-SS decided to develop its own rocket weapons, based on captured Soviet BM-8-48 Katyusha launchers. The new rocket launcher was dubbed the 8cm Vielfachwerfer, and was mounted on the same armored Maultier half-track as the Panzerwerfer 42. There were miscellaneous other rocket launchers mounted on Beutepanzer.

21cm Nebelwerfer 42

The success of the 15cm Nebelwerfer 41 led to the development of a larger caliber 21cm rocket along with its associated launcher. The 21cm Wfr Spreng rocket had about two-and-a-half times the firepower of the 15cm high-explosive rocket, but it was an exceptionally heavy munition that was difficult to transport and load. Therefore, it supplemented the 15cm Nebelwerfer 41 rather than replaced it. The launcher was essentially similar to the 15cm Nebelwerfer 41, but was fitted with five tubes rather than six. Production began in late 1942 and it was accepted for service use in March 1943. Generally, a three-battalion Werfer-Regiment in 1944 would have two battalions of the 15cm Nebelwerfer and one battalion of the 21cm Nebelwerfer.

28/32cm schwere Wurfgerät

The success of the Nebelwerfer led to the development of larger and heavier rockets. The 28cm Wurfkörper Spreng and 32cm Wurfkörper Flamm were a pair of related rockets. The 28cm rocket used a high-explosive fill while the 32cm rocket used an incendiary warhead filled with 40kg of a kerosene mixture. Unlike the 15cm rockets, these were of a more conventional design, with the warhead at the front and the rocket motor behind it.

Both of these rockets were delivered in a *Transportbehälter*, a simple wooden or steel frame that served both as a transport container and as an elementary launcher. The original Wurfgestell 40 launcher was a simple wooden frame to which four rocket crates could be attached. This type was semi-disposable due to its elementary and cheap construction. As a result, it

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SCHWERE WURFGERÄT 41

The Schwere Wurfgerät 41 was a simple metal launcher that replaced the previous wooden schwere Wurfgerät 40. The 28cm *Wurfkörper Spreng* (explosive) and 32cm *Wurfkörper Flamm* (incendiary) rockets were delivered in wooden or metal frames that also served as their launchers. The inset drawings show the 28cm Wurfkörper Spreng on the left and the larger 32cm Wurfkörper Flamm on the right.

Mr 2.1.42S
obg194162
Nn 3.6.42N
Nn 5.7.43P
1Gr
Nn 2.5.42M
obg1942/41
Nn 2.5.42M

The 30cm Raketen-Werfer 56 was introduced in 1944. It differed from the earlier 30cm Nebelwerfer 42 in the use of a new carriage type with split trails.

was short-lived and was replaced in 1942 by the more durable schwere Wurfgerät 41 frame launcher that was made of steel.

Initially, these Wurfgerät were not deployed in their own batteries, but rather were delivered to normal Werfer regiments for particular operations. A full regimental unit-of-fire could total as many as 960 rockets that could saturate an area of about 900 x 200m. Such a barrage had enormous shock value and so was often used for breaking through enemy defenses during an attack. On the other hand, the range of these weapons was poor, only about 2,200m. It took about three hours to set up the launchers, and during this period they were very vulnerable to enemy fire. They were popularly dubbed "*Stuka zu Fuß*" (Stuka on Foot) or "*Heulende Kuh*" (Howling Cow).

A mechanized launcher was also developed, mounted on the Sd.Kfz. 251 half-track or other vehicles such as the schwerer Wurfrahmen 40, with 1,980 manufactured. A towed version of the heavy rocket launcher was produced in 1941 as the 28/32cm Nebelwerfer 41. This used the standard one-axle trailer fitted with wire-frame racks for six 32cm rockets. It could be adapted for the 28cm rockets by adding liner rails. Production was short-lived, ending in December 1942, as it was felt that the range was too short to justify an expensive mobile launcher instead of the cheap frame launchers.

In its place came the 30cm Nebelwerfer 42. This used a new 30cm Wurfkörper Spreng that doubled its effective range to 4,550m. The launcher was essentially similar to the 28/32cm Nebelwerfer 41, but adapted for the 30cm rocket. It was not a particularly common weapon, with only 380 manufactured in 1943. The program was revived in 1944 as the 30cm Raketen-Werfer 56. This used a similar launch cell, but the carriage was based on the 8cm PAW 600 carriage with split trails. At least 494 were built in late 1944.

Nebelwerfer towed launcher production 1940–45

	1940	1941	1942	1943	1944	1945	Total
15cm NbW 41	282	652	969	1,188	2,336	342	**5,769**
21cm NbW 42			407	100	835	145	**1,487**
28/32cm NbW 41		34	311				**345**
30cm NbW 42				380			**380**
30cm RWfr 56					544	150	**694**
sWG 40		9,552					**9,552**
sWG 41			2,510	1,493			**4,003**
Total	**282**	**10,238**	**4,197**	**3,161**	**3,715**	**637**	**22,230**

German artillery rocket production 1939–45

	1939	1940	1941	1942	1943	1944	1945	Total
15cm Wg 41	1,880	156,750	417,250	1,208,600	1,096,100	1,985,200	184,000	**5,049,780**
15cm Kh						308,100	41,000	**349,100**
21cm Wg 42				8,980	119,600	257,400	16,600	**402,580**
28cm WK		10,000	77,150	127,700	116,200	120,000	8,800	**459,850**
30cm WK					31,000	155,000	13,300	**199,300**
32cm WK		12,000	62,550	4,570	26,300	20,300		**125,720**
Total	**1,880**	**178,750**	**556,950**	**1,349,850**	**1,389,200**	**2,846,000**	**263,700**	**6,586,330**

ARTILLERY IN COMBAT

Artillery of the Blitzkrieg era 1939–41

German field artillery played a central role in all of the campaigns of World War II. One measure of the role of the artillery in combat was the expenditure of ammunition. As can be seen on the accompanying chart, artillery ammunition production rose steadily during the war.

Field artillery ammunition production 1939–45 (rounds in thousands)

	1939	1940	1941	1942	1943	1944	1945	Total
7.5cm K Gr	119.3	140.7	6.2	93.5	42.5	15.0		**417.2**
8cm Gr 30(t)	60.4	314.1	30.0					**404.5**
15cm Gr 19	92.5	1,259.9	295.2	777.6	1,711.0	2,754.6	174.0	**7,064.8**
15cm Gr 35(t)		33.3		76.0	95.0	118.1	13.2	**335.6**
15cm leFH 18	2,112.1	10,948.7	3,551.7	18,459.8	29,440.6	38,055.7	3,226.4	**105,795**
15cm leFH 14/19 and 30(t)	4.9	379.9	419.4	23.0	168.7	436.6	173.1	**1,605.6**
12.2cm sFH 396(r)					424.0	696.7	133.0	**1,253.7**
12.2cm K 390(r)					278.5	295.8		**574.3**
15cm sFH 18	540.9	2,950.0	2,656.3	5,077.8	8,226.1	8,343.8	819.0	**28,613.9**
15cm sFH 25(t)		173.3	23.3				5.1	**201.7**
15cm sFH 37(t)	40.5	92.5	17.0	69.8	245.1	191.2		**656.1**
15cm K 16		16.4	9.5	4.6				**30.5**
15cm K 18		48.3	57.1	86.1	97.7	30.8		**320**
15cm K 39		46.8	83.7	25.4	69.0	11.4		**236.3**
15cm in Mors. Laf.			8.0	7.3	9.0			**24.3**
15.2cm KH 433(r)					256.1	428.4	75.0	**759.5**
15.5cm Gr 414/416(f)					254.9	1,041.3	54.0	**1,350.2**
17cm in Mors. Laf.			22.1	73.8	212.4	238.0	26.7	**573**
21cm Mors 18	38.9	275.3	268.1	235.7	440	459.3	33.0	**1,750.3**
21cm K 38				10.5	9.3	4.4		**24.2**
21cm K 39/40/41		2.7	2.8	14	19.8	20.7	0.6	**60.6**
Total	**3009.5**	**16,681.9**	**7,450.4**	**25,034.9**	**41,999.7**	**53,141.8**	**4,733.1**	**152,051.3**

For planning purposes, the Wehrmacht measured ammunition consumption in units-of-fire. At the start of a campaign, a division was allotted a 1st Unit-of-fire (*1. Munitions Ausstattung*). The Wehrmacht expected that this would be sufficient for about 20 average days of combat; active combat consumed this allotment much more quickly. This translated into 225–250 rounds per 10.5cm leFH light field howitzer and 150 rounds for each 15cm sFH 18 heavy field howitzer. An infantry division was allotted 600 tonnes of ammunition, a motorized infantry division 560 tonnes, and a Panzer division 730 tonnes. Of the 600 tonnes in an infantry division, 375 tonnes were artillery ammunition, with the 10.5cm leFH 18 accounting for 227 tonnes and the 10.5cm sFH 18 accounting for 108 tonnes. The remainder of the allotment was small arms ammunition, mortar rounds, Flak, and anti-tank guns.

The Polish campaign of 1939 placed little strain on the German artillery due to its short duration. Most German units were inexperienced, and the consumption of ammunition was judged to have been excessive. Although

A pair of 10.5cm leFH16 during a military parade in Warsaw on October 6, 1940. The older pattern Protze accommodated only three gunners.

A 10.5cm leFH 18 für Bespannung of Artillerie-Regiment.234, 163. Infanterie-Division being towed through Lillehammer, Norway, in April 1940 behind its Pferdezugprotze caisson by its six-horse team. This is the 1930s pattern Protze that could accommodate all five gunners on the caisson.

popular accounts accent the role of tanks and Stuka dive-bombers in the campaign, Polish accounts note the devastating role played by German artillery in the rout of the Polish army.

The 1940 campaign in France and the Low Countries led to the consumption of 88,460 tonnes of ammunition or about 2,055 tonnes per day. In the case of the standard field artillery types, the 10.5cm leFH 18 consumed on average 1.13 units-of-fire, the 15cm sFH 18 consumed 1.97 units, and the 15cm sIG 33 consumed 2.37 units during the campaign. This was less than anticipated, which led to the decision in Berlin to curtail ammunition production later in 1940.

Artillery on the Eastern Front 1941–45

When preparing for the invasion of the Soviet Union in the summer of 1941, Berlin recognized that a cutback in ammunition production in the second half of 1940 had been a mistake. Ammunition holdings for critical ammunition types had only increased by about 30 percent compared to the stockpiles available before the battle for France. By June 1941, the Wehrmacht had about two units-of-fire per infantry division and about three per Panzer division, the OKH (*Oberkommando des Heeres*: Army High Command) had another 20 divisions' worth in its reserve. Ammunition expenditures soon proved to be much higher than anticipated compared with the campaigns in 1939–40. By September 1941, infantry divisions were consuming more than two units-of-fire per month.

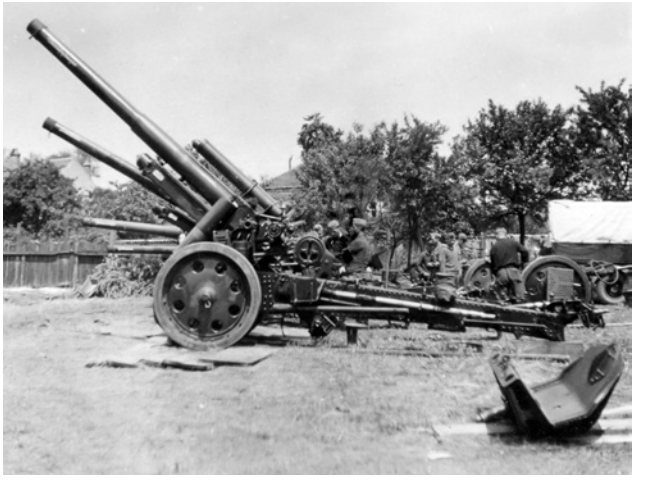
A battery of 10.5cm leFH 16 light field howitzers in action near Novgorod during the late summer of 1941 during the advance by Heeresgruppe Nord toward Leningrad. At least 14 German infantry divisions were equipped with these howitzers in their light artillery battalions in 1941.

In 1941, Soviet artillery did not compare very favorably with German artillery. At the outset of the fighting in June 1941, the Red Army had 33,200 field guns, of which the divisional guns were predominant. The various 76.2mm divisional guns represented 46 percent of the total, and the 122mm howitzer represented another 24 percent. The Soviet arsenal was more than double the total Wehrmacht's. In spite of its numerical advantages, the catastrophic performance of the Red Army in 1941 led to severe losses, totaling 24,400 Soviet field guns. In addition, the Red Army lost more than half of its munitions plants that were concentrated in Ukraine.

By the start of 1942, the Red Army's field artillery had been reduced to 18,900 guns, one of the few times during the war when Soviet and German field guns were nearly equal in number. Soviet weapons factories were restored in 1942. Soviet artillery gradually improved at a tactical level. By the beginning of 1943, the Red Army field artillery arsenal had recovered, with a total of 36,700 field guns available

at the start of the year. However, Soviet fire control remained poor, and the throw-weight of Soviet divisional artillery remained inferior to German divisional firepower.

To begin with, the standard Soviet field artillery weapon was the 76.2mm divisional gun, typically the ZIS-3 M1942. This fired a 6.4kg projectile versus the 14.8kg projectile of its German counterpart, the 10.5cm leFH 18. Likewise, the Soviet 122mm M-30 howitzer fired a 21.7kg round versus the 43.5kg round of the 15cm sFH 18. Not only was the Soviet divisional artillery lighter in throw-weight, but Soviet units-of-fire were generally smaller than German practices, with only 144 rounds per 76mm divisional gun and 96 per divisional howitzer.



A battery of 15cm sFH 18 für Kraftzug with the rubber-rimmed wheels for motorized towing.

German artillery ammunition production significantly increased in 1942, but was barely enough to meet demands. Shortages of artillery ammunition began to plague the Wehrmacht in 1942, especially toward the end of the year and the catastrophic encirclement of the 6.Armee in Stalingrad. Nearly 20,000 tonnes of ammunition were lost when Stalingrad finally fell. As the capabilities of German infantry diminished, German artillery was called upon more and more often to redeem unfavorable German battlefield circumstances. On top of this, Hitler allotted the Panzer force priority for industrial resources. As a result, a new generation of field guns developed in 1942 were put on the shelf. In addition, Berlin capped field artillery ammunition production, arguing that the number of guns being manufactured did not warrant such high ammunition production. Nevertheless, the Wehrmacht continued to enjoy a pronounced advantage over the Red Army in terms of artillery ammunition expenditure.

Artillery Ammunition Expenditure 1942–45*

	1942	1943	1944	1945	Total
Red Army (rounds, thou)	23,291.1	37,652.1	44,571.2	11,090.6	**116,605.0**
Wehrmacht (rounds, thou)	31,785.6	45,431.8	55,427.0	8,065.3	**140,709.7**
Red Army (tonnes)	446,114	828,193	1,000,962	239,113	**2,514,382**
Wehrmacht (tonnes)	709,957	1,121,545	1,540,933	205,020	**3,577,455**

*Jan–Feb 1945

By 1943, artillery stockpiles were not keeping up with consumption during the critical summer campaign months. In July 1943, the Wehrmacht set a new record for artillery consumption, expending 3.5 million rounds but resupplying only 2.1 million. It's worth noting that this was not especially high compared to World War I, when German artillery was consuming about 10 million rounds per month in 1918. The disparity between consumption and supply was much the same in August and September 1943, with consumption of 6.6 million rounds but resupply of only 5.1 million. With the fronts calming down in the autumn, the OKH was able to deliver about

ABOVE LEFT
A 15cm slG 33 für Bespannung being towed behind its Pferdezugprotze caisson by the usual six-horse team.

ABOVE RIGHT
The 21cm Mörser 18 was supposed to be towed in two loads to prevent its Sd.Kfz. 8 half-track from being overworked. However, it could be towed in a single 22 tonne load in emergencies. This is an example that was captured by the Red Army in East Prussia while being evacuated.

130,000 tonnes of ammunition in November and December 1943 above consumption, staving off the crisis until 1944. Artillery was the primary consumer of army ammunition, accounting for about 66 percent compared with 14 percent for infantry munitions and 13 percent for Panzer munitions. The two predominant consumers were the two divisional howitzers, the 10.5cm leFH 18 that accounted for 70 percent of artillery consumption and the 15cm sFH 18 that accounted for another 19 percent.

By 1944, German field artillery was badly overstretched even though German industry that year produced more guns and more ammunition than in any previous year. Soviet field artillery had climbed to 53,100 field guns as well as 4,800 multiple rocket launchers. In comparison, German field artillery on the Eastern Front in early 1944 totaled only about 6,475 field guns. Although it might seem that the Red Army had an 8:1 advantage, this was seldom the case on the battlefield since many Soviet guns were tied down away from the battlefield for training, static defense, and other roles. During the summer 1944 fighting, the Red Army's numerical advantage was usually about 3:1, though there were occasions when local artillery concentrations during offensives exceeded that. The Wehrmacht was able to maintain a measure of artillery dominance during the 1944 fighting due to volume, firing on average about 4,200 tonnes daily compared with about 2,700 tonnes by the Red Army.

The situation for German artillery in the latter half of 1944 degenerated rapidly. There was a substantial loss of artillery during the Soviet summer offensives, with many of the divisions of Heeregruppe Mitte destroyed during Operation *Bagration*. German field gun losses from May 1943 to May 1944 had only been 536 guns. In contrast, German losses from June to September on all fronts were 6,340 guns, of which 1,398 were Beutegeschütze lost mainly in France. Total German artillery losses from June to December 1944 were

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21CM MÖRSER 18

The 21cm Mörser 18 had such violent recoil when firing that it had an unusually elaborate recoil system. When emplaced, the two forward carriage wheels were raised and the box trail rested on two pads. This consisted of a circular pad directly under the gun, and a spade plate at the rear. The carriage had limited traverse of about 8 degrees to either side using an arc mounted on the spade plate and a pivot mount on the main platform. In addition, the howitzer was provided with a double recoil system. Besides the usual recuperator, the barrel and trunnion were mounted on a saddle assembly that recoiled along the carriage. This was reminiscent of heavy railroad gun designs of the World War I era. One of the carriage's more interesting recoil abatement features was the provision for three ground anchors that could be emplaced with stakes in an arc in front of the howitzer, attached by steel bars to the central pad.

The 122mm A-19 M1931 corps gun were often taken into German service where they were designated as 12.2cm Kanone 390 (r). Of the 200 in German service in 1944, about 110 were in use in France like this example from Batterie.10, Artillerie-Regiment.265 in the Normandy fighting.

a staggering 10,077 field guns, roughly half of the Wehrmacht inventory.

German artillery ammunition production continued to gradually rise through August 1944. The start of the Allied strategic bomber campaign against the German synthetic fuel industry in the summer of 1944 caused significant collateral damage to the German chemical industry, thereby throttling German ammunition production and leading to near total collapse in 1945.

Artillery on the Western Front 1944–45

In the expectation of an amphibious invasion of France in 1944, German forces assigned to the Western Front had been considerably increased at the expense of the Eastern Front in the first half of 1944. By March 1944, the Wehrmacht had 7,960 field artillery in the East compared with 4,920 in France. However, 2,415 field guns in France were tied down in the Atlantikwall defenses, nearly half the available total.

The ammunition situation in France in June 1944 was adequate. As a general rule of thumb, the OB West theater command had planned to allot three units-of-fire per standard division and Heeresartillerie regiment, with 1.5 units-of-fire held by the division and another 1.5 units-of-fire in the field army holdings. The field army holdings in Normandy were stored at nine AML (*Armee-Munition-Lager*) which on D-Day contained 18,738 tonnes of artillery ammunition or roughly one unit-of-fire for 30 divisions. The static infantry divisions along the coast were supposed to be allotted four units-of-fire on the presumption of very intense ammunition usage on the days after the invasion. Also, these units were equipped mainly with Beutegeschütze that used a hodge-podge of captured ammunition not in the usual Wehrmacht logistics chain. Beyond these army depots, OB West controlled two additional HML (*Heeres-Munition-Lager*) in the Paris area with a further 20,187 tonnes of ammunition.

When Operation *Neptune* unfolded on June 6, 1944, the artillery regiments of the German infantry divisions along the D-Day beaches expended their one unit-of-fire in a single day. Although German artillery ammunition reserves were in place, the Wehrmacht in Normandy soon found that the main problem was moving the ammunition supplies forward. The motorized transport of the munition depots could not move forward in daylight due to Allied air attack, and the static coast defense divisions lacked the horse transport needed to collect the ammunition. German field guns were soon outnumbered by Allied field guns, while at the same time, the artillery battalions were starved of ammunition.

This remained a significant problem through the Normandy campaign even after

One of the most common Czechoslovak field guns in Wehrmacht service was the 10cm leFH 14/19(t), a slightly modernized version of the type used by the Austro-Hungarian army during World War I. In 1944, these were especially common in German static infantry divisions along the Atlantikwall, such as Artillerie-Regiment.1716 on the D-Day beaches in Normandy. Of the 254 still in service in 1944, 225 served in France.

additional Panzer and infantry divisions arrived. As a result, the Wehrmacht was subjected to Allied artillery firepower far in excess of what might be anticipated based on gun strength. For example, during July 1944, Panzergruppe West facing the British and Canadian forces estimated that its 142 artillery batteries were facing about 350 Allied batteries, a 1:2.5 disadvantage. However, the Allies fired about 1,448,500 rounds during this period versus 341,000 from German artillery, or a 1:4.2 disadvantage.

The war-booty Soviet 76.2mm regimental gun M1927 was called the 7.62cm Infanteriekanonehaubitze 290(r) in Wehrmacht service, and there were more than 1,815 in German use. This example was deployed by Grenadier-Regiment.917 in the defenses of Fort de l'Eminence on Port-Cros, on the Îles d'Hyères off the coast of Toulon. It was captured by the Devil's Brigade during Operation *Dragoon* on August 15, 1944.

The contest between German and Allied artillery showed a technological and tactical gap far more severe than on the Eastern Front. Virtually all British and American artillery was motorized and its logistical chain was much more robust. Gun-for-gun, German artillery battalions were technically similar to Allied battalions. But the Allies had significant advantages in command-and-control due to a superior radio network, much better fire control due to sophisticated fire direction centers a generation beyond those of the Wehrmacht, and many other technical innovations such as organic spotter aircraft.

The situation only became worse after Normandy due to shortages of equipment, ammunition, and trained specialists. General der Artillerie Karl Thoholte, head of artillery forces on the Western Front in 1944, later remarked that "Owing to the bloody losses and uninterrupted, maximum psychological strain in the heavy defensive battles, the German infantry continuously lost combat power. More and more, the defense depended upon artillery. In many cases, it decided the issue. It was estimated that the artillery bore 60 to 80 percent of the combat burden."

This viewpoint was repeated by infantry commanders as well. Gerhard Engel, commander of the 12.Infanterie-Division at the heart of the German defenses in Aachen in September 1944, noted the vital importance of artillery in these battles:

> Combat soon demonstrated that this was not primarily a battle between the front-line [infantry] troops, but one of materiel. The German troops could hardly have been expected to succeed in the defense had it been appreciated beforehand the amount of weapons and ammunition the enemy expended against them. On the German side as well, the battle was not dominated by the infantry. Although our stockpiles were insufficient, our fights had to be conducted with materiel. So the third battle of Aachen was dominated by artillery. While completely acknowledging the heroic struggle of the infantry, it still must be recognized that the success of the defense was achieved by artillery in practically all cases. Under strict and skillful direction, our artillery smashed enemy concentrations; with well-controlled barrage fire it stopped enemy attacks; during the final days of the battle, it halted the enemy attacks with direct fire.

While German field artillery continued to be one of the Wehrmacht's most potent combat arms for the remainder of the war, it had fallen behind the

An RSO/03 tracked prime mover towing a 10.5cm leFH 18/40 that was captured by the US Army 1st Division near Frauwüllesheim, during the fighting along the Roer River on February 28, 1945.

Allied armies' technically and tactically. Regardless of the exemplary performance of the outnumbered German artillery in the late 1944 fighting, it was overwhelmed by Allied artillery. The US Army's VII Corps offered a pungent assessment of German artillery in the autumn 1944 border battles for Aachen:

> The German artillery has not been able to cope with American artillery. It lacks especially the organization for massing of fires, the communications, and the airplane observation which characterizes American artillery. He is now terrifically handicapped by transportation trouble due to the loss of motors and horses, and shortage of gasoline. The counter-battery fire received from German artillery to date has been negligible. Massed fires are rare and brief. Harassing programs have been inaccurate and incomplete. It has been obvious again and again that an observer must be close to his guns in order to conduct fire. German artillery fires which fell ineffectively in plain view of German OP [observation post] positions with good visibility, and which with slight correction would have been very damaging for us, have continued to fall into the wrong place. The most common form of fire has been the single gun. The accurately adjusted fire of one battery, which would usually mean slightly more difficult communications from one observer to battery than fire by a single gun, has been much less frequent. A concentration by more than one battery has been rare, even in the Aachen area at a time when there were approximately 25 battalions of German artillery in front of VII Corps.

The Wehrmacht's surprise Ardennes counter-offensive in December 1944 was one of the few occasions when German artillery had numerical superiority over US artillery, totaling about 1,550 field guns, or roughly a 3:1 advantage. Yet this failed to become a decisive factor in the campaign. German artillery performance suffered from the usual problems of poor mobility, weak command-and-control, and inadequate ammunition supply. Heeresgruppe B had been promised 116,500 heavy howitzer rounds, but only 30,000 rounds were delivered by the start of the attack. Another problem was that Hitler insisted that no artillery reconnaissance take place before the attack for fear it would reveal the location of the offensive. As a result, the barrages initiating the offensive consumed a great deal of ammunition while at the same time being largely ineffective due to poor targeting. During the first weeks of the battle, the Allied tactical air forces strangled the German rail and road network from the Rhine to Belgium, cutting off access to the ammunition reserves held in Germany. Allied reinforcements began to redress the numerical artillery imbalance, restoring US artillery dominance within a week after the start of the campaign. German field artillery continued to decline through the last months of the war, outnumbered, outgunned, and increasingly irrelevant.

FURTHER READING

There are numerous books devoted to the German field artillery of World War II, but the vast majority are equipment catalogs providing technical detail with little tactical or organizational context. The best single book is Charpentier's recent publication, but it is in French, which limits its accessibility to our readers. The German magazine *Waffen Revue* published numerous excellent articles on various German guns and rocket launchers for those looking for more in-depth technical coverage.

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GLOSSARY

Abteilung	battalion
Bespg.	für Bespannung: for [horse] team towing
Beutegeschütze	war-booty gun
Bodenständige	static (e.g., static infantry division)
(f)	(*französisch*): French
Geb H	*Gebirgshaubitze*: mountain howitzer
GHQ	General Headquarters
Heeres-Artillerie	field army artillery; also known as GHQ artillery
HL	*Hohlgranate*: hollow-charge projectile
HWA	*Heereswaffenamt*: Army Weapons Directorate
K	*Kanone*: gun (e.g., K 18, Kanone 18)
Kfz.	*für Kraftzug*: for truck towing
KStN	*Kriegsstärkenachweisungen*: war establishment strength
leFH	*leichtes Feldhaubitze*: light field howitzer
leFK	*leichte Feldkanone*: light field gun
leIG	*leichte Infanteriegeschütz*: light infantry gun
Mors. Laf.	*Mörserlafette*: mortar carriage
NbW	*Nebelwerfer*: smoke launcher
OB West	*Oberbefehlshaber West*: High Command – West
PaK	*Panzerabwehrkanone*: anti-tank gun
(r)	(*russisch*): Russian
SdKfz	*Sonderkraftfahrzeuge*: Special [army] vehicle
sFH	*schwere Feldhaubitze*: heavy field howitzer
sIG	*schwere Infanteriegeschütz*: heavy infantry gun
sWG	*schweres Wurfgerät*: heavy launcher
(t)	(*tschechisch*): Czech
Werfer	launcher
WGr	*Werfer Granate*: projectile for rocket launcher
WK	*Wurfkörper*: launcher projectile